



FRIDAY, JULY 1.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Elections.—Iberville, Dunham & Clarenceville, E. J. Chamberlain, President.—New Mexico Central, Judge Henry L. Waldo, President.—Pittsburgh & Western, James Calhery, President.—Marshall, Paris & Northwestern, John Martin, President.

Personal.—Died: M. M. Green.—A. A. Talmage.

New Companies Organized.—Butte & Ruby Valley is incorporated in Montana.—Chattanooga Southern is incorporated in Georgia.—Chicago, East & West obtains charter in Illinois.—Dakota Union is incorporated in Dakota.—Erie & State Line applies for charter in Pennsylvania.—Garfield, Pawnee & Colorado is chartered in Kansas.—Green Bend, Water Valley & Western obtains charter in Kansas.—Los Angeles County files articles in California.—Louisville, Cincinnati & Virginia is organized in Kentucky.—Mackenzie, Ohio & Mississippi files charter in Tennessee.—Minnesota Belt Line Railway & Transfer Co. is incorporated in Minnesota.—New Mexico Central is organized in New Mexico.—Omaha & Yankton is incorporated in Nebraska.—Pueblo, Bessemer & Highland Park Circle is organized in Colorado.—Red Cloud, Kirwin & Southwestern is incorporated in Kansas.—St. Johns River, Lake Mir & Gulf files charter in Florida.—St. Paul Belt is incorporated in Minnesota.—Topeka, Stockton & Northwestern is incorporated in Kansas.—Trumbull & Mahoning is incorporated in Ohio.—Utah Railway Co. is incorporated in Utah.

Changes and Extensions.—California: Pacific Coast will be extended 12 miles.—Illinois: Atchison, Topeka & Santa Fe starts survey from Litchfield to St. Louis. Chicago & Eastern Illinois is extended 21 miles from Sidell.—Maine: International of Canada is being extended 200 miles.—Virginia: Roanoke & Tar River has track laid 9 miles from Boykins.

Leases and Sales.—New York, Woodhaven & Rockaway is sold.

Traffic.—Anthracite coal shipments for the week ending June 25 show an increase of 26.6 per cent. as compared with the corresponding week last year; bituminous shipments show increase of 6.8 per cent.; coke, for week ending June 18, shows decrease of 66.8 per cent.—Cotton receipts, in interior markets, for the week ending June 24, show a decrease of 28.4 per cent. as compared with corresponding week last year; shipments show a decrease of 62.1 per cent.; seaport receipts show decrease of 83.6 per cent.; exports, a decrease of 79.7 per cent.; cotton in sight is less than at same date last year by 30.4 per cent.

Miscellaneous.—An injunction is granted forbidding the building of the Arthur Kill bridge.—Chicago, St. Paul & Kansas City will build shops at St. Joseph, Mo.—Northern Pacific will build shops at Mandan, Dak.—Paducah & Mount Vernon is the consolidation of the Mount Vernon & Wabash and Paducah & Mount Vernon.—Pittsburgh & Western is reorganized.—Toledo, St. Louis & Kansas City changes Eastern Division to standard gauge.

Contributions.

Electricity and Brakes.

CHICAGO, Ill., June 25, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The practical man who ventured to express in your number of June 10 some opinions adverse to the Carpenter electric brake, as shown at the Burlington brake trials, is commented on in your issue of June 17 by Mr. J. Fairfield Carpenter, and haughtily interrogated by "E. M. F." In reply he wishes to quote from the report of the Committee on Freight Train Brakes of the Master Car-Builders' Association the following remarks, which seem to him to indorse or fully confirm his opinions. First: In the report of the Subcommittee on Electric Features of Brakes (page 396 of your journal), they say as to the Carpenter brake:

"From the way in which the circuit is run, it is easily seen that should an accident happen to any of the wires, causing a rupture at any point, the brakes between such point and the engine would be unaffected thereby, while those on the other section would, of course, be inoperative." Again, "We found the conducting wires used fairly well insulated throughout their length, except at points where connection was made between wires to valves and the main conductors. No attempt at insulating these joints is made. Perfect insulation is of great importance in this system, for, should a cross occur between the two conductors, instead of the brakes being applied when an attempt was made to do so, the release, as well as the admission valves, would be open, and should the current be maintained, the auxiliary reservoir, the train pipe and the main reservoir would all be completely bled. Should either wire come in contact with any metallic connection, either with the train pipe or any of the braking apparatus, or any part of the car forming metallic connection with the track, the result would be that either the admission valves would cease to operate by electricity and the brakes could not be set thereby, or, being set, they could not be released, depending upon which wire was touched or grounded. Rain, sleet or snow would work very much to the disadvantage of the electric appliances of this brake, if the connecting wires are not well and completely insulated."

So much for "the self satisfaction of conservative ignorance," to which E. M. F. so delicately refers, contrasting it with his own immense anticipations of what the future has in

store for us, when evolution shall have developed that better educated and more intelligent class of men which is to operate our trains in future.

Mr. Carpenter says that the Practical Man is incorrect in stating that the failure of his apparatus took place immediately after a satisfactory stop had been made; for it was the first stop of the day. It was the first official stop of the day, made in the course of the experiments; but it was not the first stop of the train on that day; for the train stopped after starting, in the yard at Burlington, by the use of the electric brakes; and when the brakes were thus tested before starting, they had been found in a satisfactory condition; and, as remarked in your report of June 3, "It is somewhat singular that this defect was not discovered when the brakes were tested in the yard before starting for the run." (Railroad Gazette, p. 367.)

I agree with Mr. Carpenter, however, when he says that it will become the Westinghouse Company to call the use of electricity impracticable, since that company was the only one whose electrical apparatus did not fail at the trials. As I said before, it is only the conservative ignorance of the Practical Man which pronounces it impracticable. This conservative ignorance has been developed by the continuous use of the telegraph and telephone, and electric signaling during upward of forty years. The current, and the magnets, and the batteries, and the contacts, and all the multitudinous delicate electric contrivances now employed by Mr. Carpenter for braking having been tested thousands of times in these other applications, only to find that they could not be depended upon; that when most needed, the batteries, or the contacts, or the magnets, or the armatures, or some other one of these contrivances would be sure to fail even though stationary and under cover, and they require a body of trained experts to find out what is the matter with them.

E. M. F. asks: "What sort of a practical man does your correspondent call himself to propose sending out such a lot of delicate contrivances in the care of an ordinary train crew?"

Your correspondent finds himself practically obliged, at the present time, to use such crews as are now in the service for operating trains; but if the use of these delicate contrivances is to be adjourned until the able and watchful experts have been educated in sufficient numbers, what now is an entirely impracticable system may possibly become practicable, though dangerous. It should be borne in mind, however, that the wish for continuous brakes on freight trains is becoming very strong, by reason of the present necessity for rapid transportation; and the Westinghouse Company reports that there are already more than 50,000 freight cars equipped with its brake, which does not require the creation or evolution of a new order of beings, but can be run by ordinary train crews. The practical man has however, no valid objection to offer to the development of this new order of beings, although he does not anticipate that they will do flagging any better than the present race; the block signals will soon render flagging less onerous than it has been, so that either the present or future order of trainmen will be better off, especially after the trains are fitted with reliable continuous brakes. And is it not probable, Mr. Editor, that these ameliorations of the condition of trainmen will of themselves render their occupation more attractive that it is at present?

And I repeat what I started out with in my first letter, which I think has not been disproven: that "the experiments at Burlington have fully demonstrated that the electric current cannot be depended upon for controlling freight trains in regular business in the present state of the art." And I wish to add that we have no instance, as yet, of the use of the electric current over any long time under the most advantageous circumstances, which would justify us in relying upon it for the safety of life and property.

These are the convictions of a PRACTICAL MAN.

[There seems to be some doubt whether the Carpenter brake, on the occasion referred to, was or was not tested before leaving the yard, and certainly no stop had been made previous to the official stop on the grade.—ED. R. R. GAZETTE.]

Flagging Trains.

VERMONT, May 31, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The requirement that freight trains must always approach stations carefully, which I see you advocate as being necessary to safety, is already in force on some of the roads in this section, and I think on a number of others in various parts of the country. It does not seem to be a very difficult thing to accomplish. If you think that the employment of a rule of that kind would cause delay and inconvenience you have but to ask the hundreds of conductors and brakemen who have worked under the system.

P. H. C.

[The point which we have sought to make prominent was not so much the enacting of a rule as the enforcement of it, so that it would place on a better defined basis the troublesome matter of flagging. Many roads have a rule of this kind; one of the best that we now recall being: "All trains except first-class trains must approach all stations, water tanks and coal chutes 'under complete control,' expecting to find the preceding train on the main track, whether it may be a stopping place, as per table, for that train or not." But the weakness lies in the fact that "all stations" (which we have italicized) is generally allowed to be construed rather loosely; and the rule generally has

another paragraph encouraging looseness, viz.: "This will not relieve the conductor of the forward train from signaling the approaching train and taking all necessary precautions to prevent accidents." The approaching train, as long as it knows the one ahead of it must send out a flag, will place more or less dependence upon that fact. The uniform code improves on this by naming the length of view, the length of time the man may wait before starting and the distance he must go; but still leaves the rule in such a shape as to require a great deal of flagging. Flagging can be enforced only by having an inspector constantly on the road, and an inspector can work to good advantage only when his requirements have reason as well as law to back them up; this is why we advocate throwing all the responsibility upon the approaching train wherever it is possible to do so without detriment to the service. Brakemen will not listen to reason so readily, when told to flag, as they will when required to control speed; and, in other ways, it is easier to enforce the latter method of securing safety. The stations, water-tanks, coal-chutes, crossings, draw-bridges and all places to which the rule refers, should be indicated by name, and limit posts to define their bounds should be rigidly maintained; and each trainman should have it clearly shown in connection with his train number on the time-table what his duties are concerning speed and concerning flagging at each of the places.—EDITOR RAILROAD GAZETTE.]

The Poughkeepsie Bridge.

The illustrations of the Poughkeepsie Bridge work given in this issue, and the notes which follow, have been obtained by the courtesy of the Union Bridge Co. and of Mr. J. F. O'Rourke. Mr. O'Rourke is preparing a paper on the subject for the Knatterskill convention of the American Society of Civil Engineers, and by the usage of the society we are prevented from anticipating the reading of that paper by publishing in much detail the facts which he will present.

The total length of the Poughkeepsie Bridge will be 6,667.25 ft. The west approach is 1,033.5 ft., being a viaduct of two pin connected trusses of 145 ft. each, 7 latticed girders of 60 ft. each, one of 53 ft., and nine plate girders of 30 ft. each. The total length of the bridge proper is 3,093 ft. 9 in., consisting of two shore spans (the shore arms of the cantilevers) of 200 ft. 19½ in. each, and five river spans of from 525 to 548 ft. each. These spans are cantilevers with connecting spans. The east approach is 2,640 ft., being a viaduct of one truss of 175 ft. span, one of 161 ft., three of about 116 ft. each, and the rest latticed and plate girders of from 30 to 85 ft. each.

The elevation of the base of rail above high water is 212 ft. and the head-room is from 130 ft. to 163 ft. The river piers from 30 ft. above high water are latticed towers. The structure is entirely of steel, even to the rivets, excepting some portion of the viaduct approaches.

The general design of the subaqueous work is shown in the crib, figs. 5 and 6. These cribs are sunk to the sand and gravel, at a depth of 135 ft. below high water, entirely by dredging. There are 52 × 100 ft. on top, and 60 × 100 at the bottom. They were designed to be 50 × 100, but it was found that the 8 × 10-ft. shafts were too narrow for convenient dredging, and the sides were made vertical from the point at which the shafts were 9 ft.

The weighting pockets are loaded with gravel as the work proceeds. The shafts are filled with beton, containing 1½ bbls. of cement per cubic yard, mixed with clean gravel and sand. The beton is mixed on scows anchored over the shafts of the cribs, the mixer being a very simple and effective one. It is a rectangular tube, revolving on a shaft, and placed at a proper inclination to run the mixture through to the buckets by which it is lowered. The pressure on the concrete at the base of the cribs will not exceed 4 tons per square foot.

The cribs are anchored in position by very effective crib anchors, or Chinese anchors as they are called locally. These are cribs of 3-in. plank, each of something over 200 cubic feet capacity, filled with some 10 tons of stone. These anchors are launched in position from scows by running them overboard from greased ways. They are made fast to the cribs by 1½-in. steel wire rope cables. They are placed 500 to 600 ft. distant from the caissons on the four sides. The anchors may be lifted and transferred from crib to crib, and are now used to stay the top of the piling for the false work for the western 500-ft. connecting span, as shown in fig. 11.

The piers are numbered from the west, and No. 2 is the first one in the water. This has been perhaps the most troublesome one so far. About 10 years ago the American Bridge Co. built the pier. They put down a crib with a coffer dam on the top of it, preparatory to building the masonry. When the coffer dam was pumped out it floated and tore off the top of the timber crib. The coffer dam was then abandoned and a pneumatic caisson sunk on the top of the crib on which the masonry was built. The Union Bridge Co. found that this old masonry was too small to be available. They removed it down to 10 ft. below high water, built a coffer dam around it, upon the top of the old crib, and have now pumped out the coffer dam and are laying the masonry for the new pier. The arrangement adopted is elsewhere shown in figs. 2, 3 and 4.

The coffer dam, it will be seen, is designed to remain as

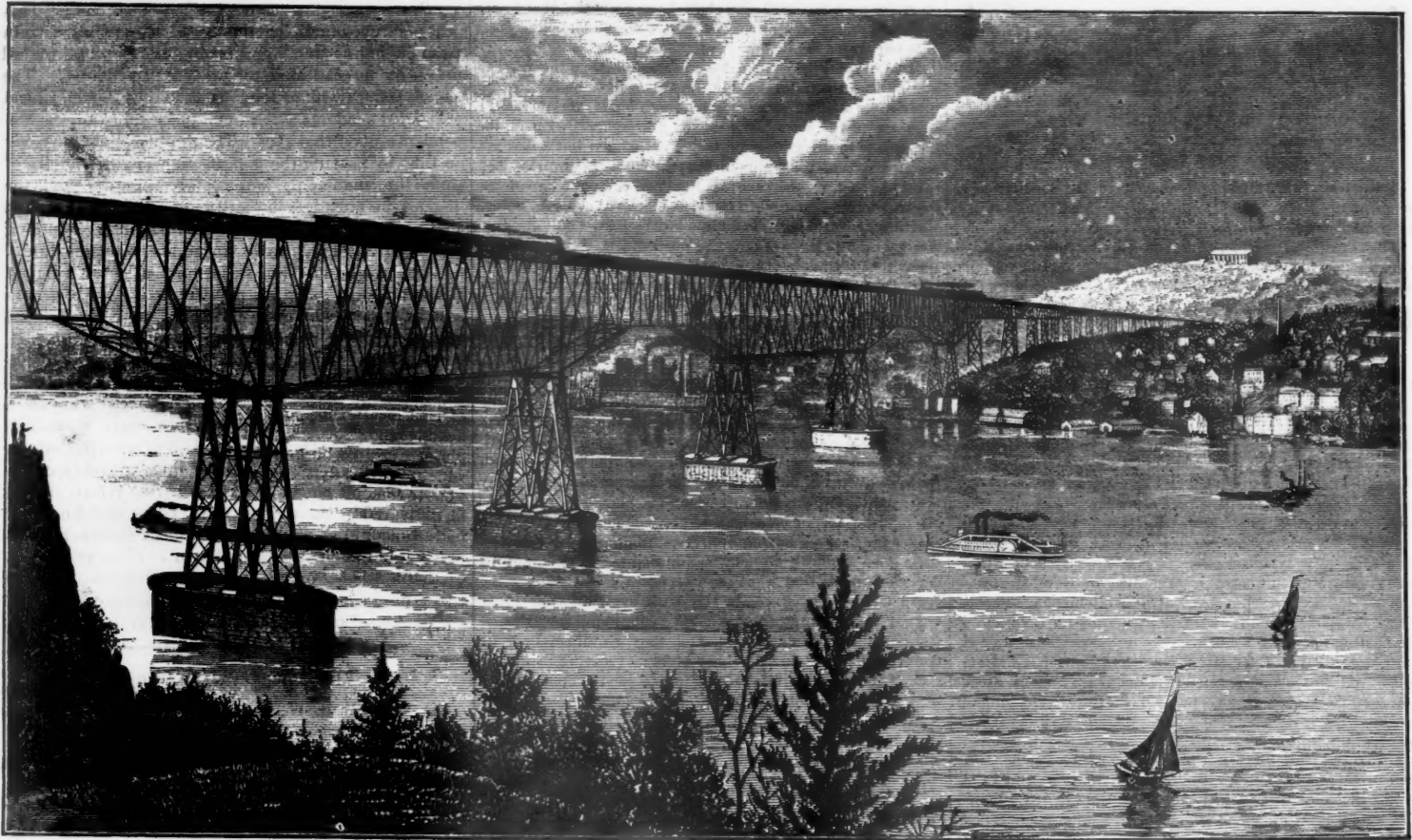


Fig. 1. Perspective View.

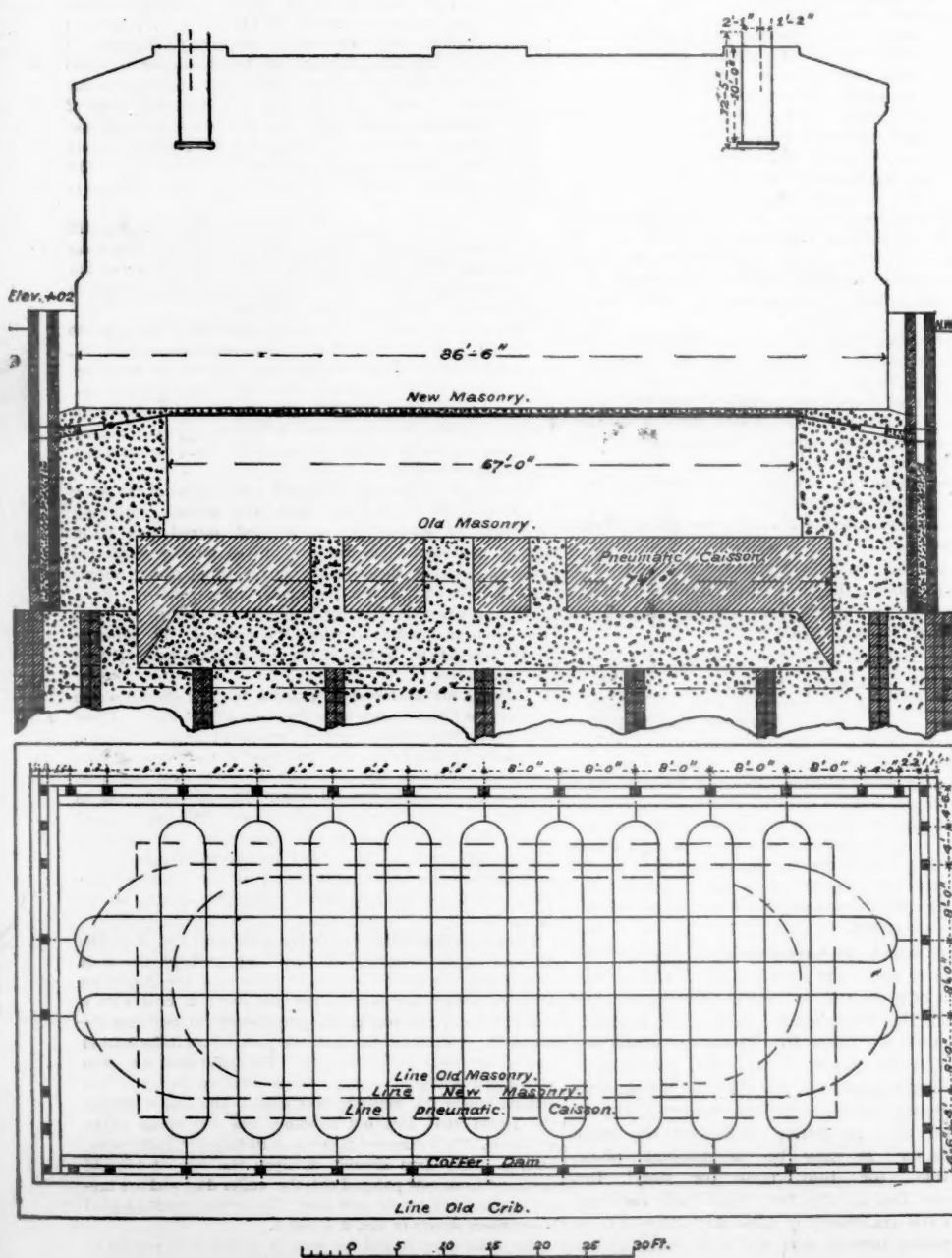


Fig. 2. Pier No. 2, Plan and Longitudinal Section.

POUGHKEEPSIE BRIDGE,—UNION BRIDGE CO., ENGINEERS AND CONTRACTORS, 1887.

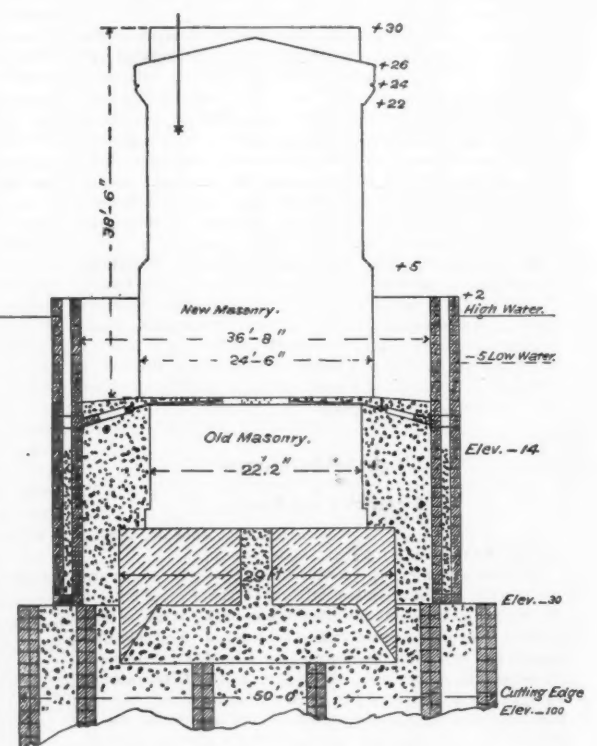


Fig. 3. Pier No. 2, Transverse Section.

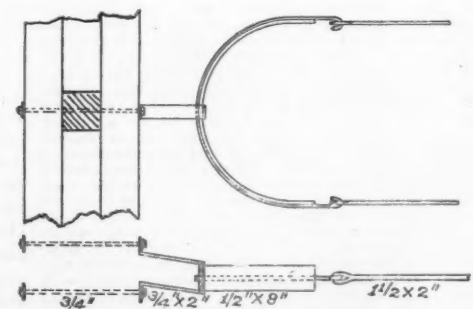


Fig. 4. Detail of Tie-Rods in Coffer Dam.

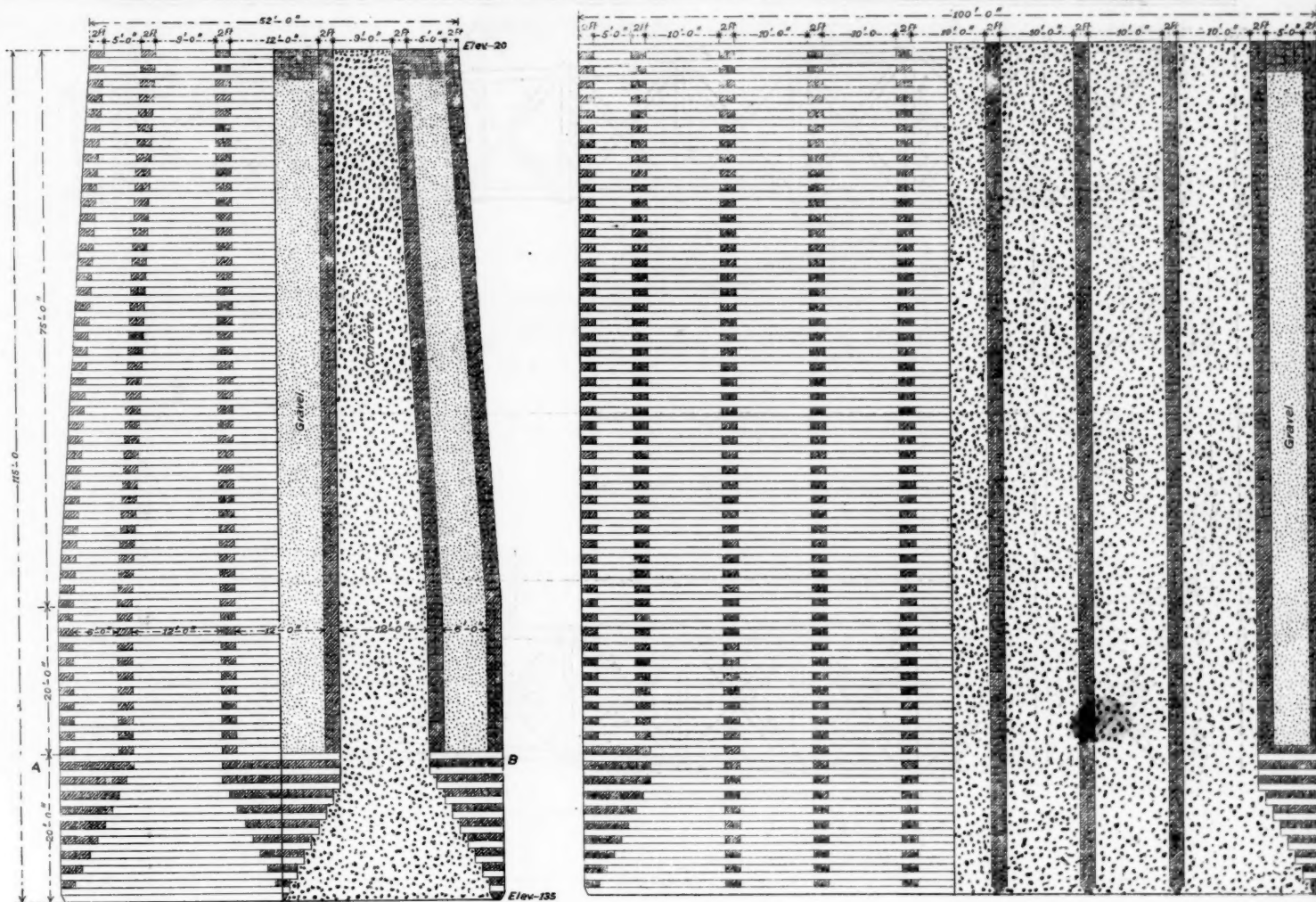


Fig. 5.—Crib No. 5, Elevations and Sections.

Scale, 1 in. = 20 ft.

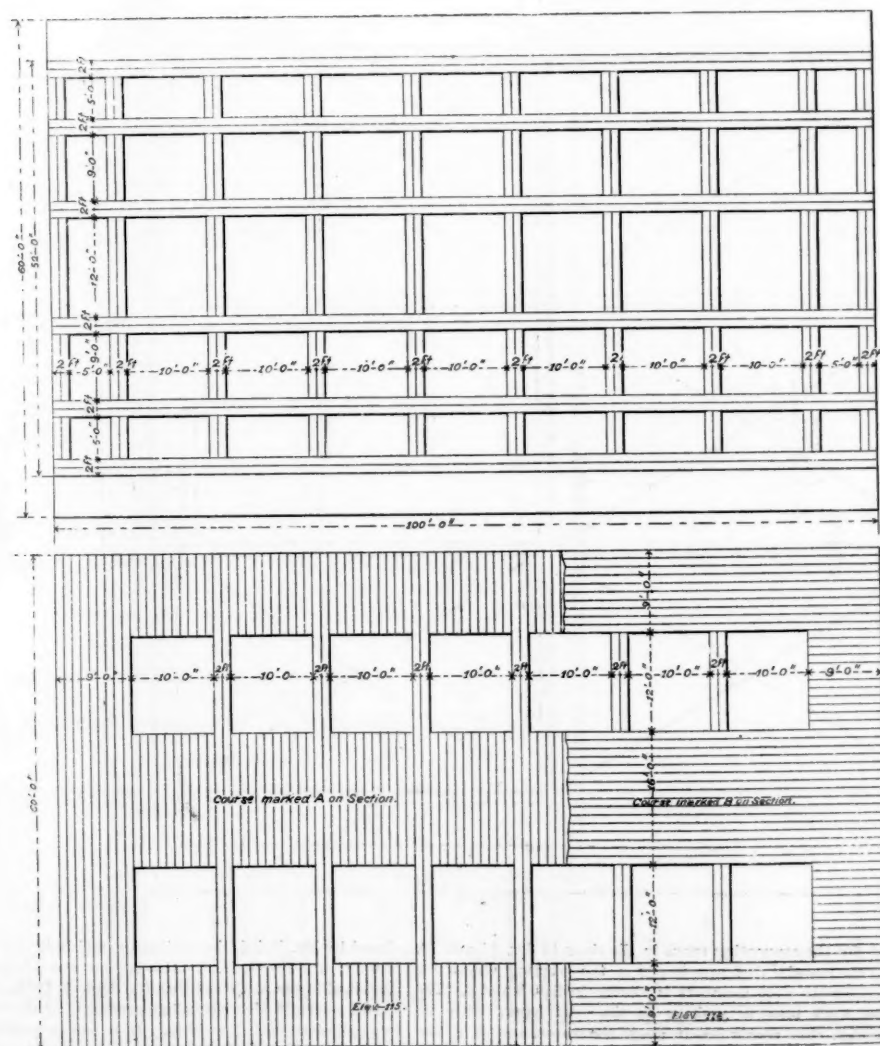


Fig. 6.—Crib No. 5, Plans.

Scale, 1 in. = 20 ft.

POUGHKEEPSIE BRIDGE—UNION BRIDGE COMPANY, ENGINEERS AND CONTRACTORS, 1887.

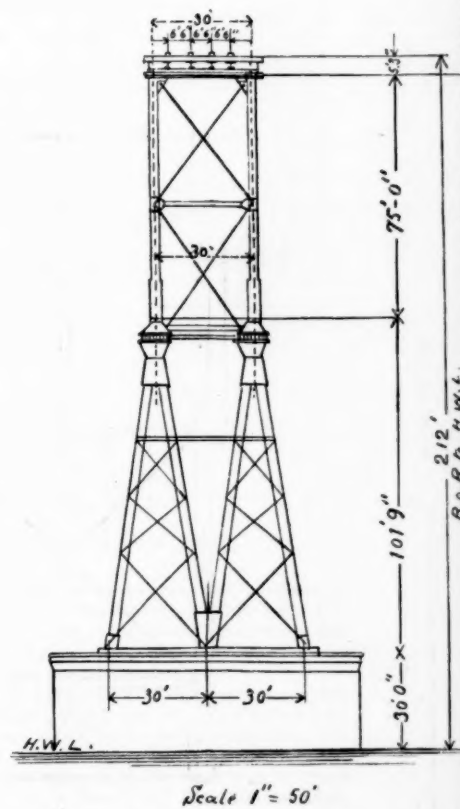


Fig. 7.—Cross-Section and Elevation.

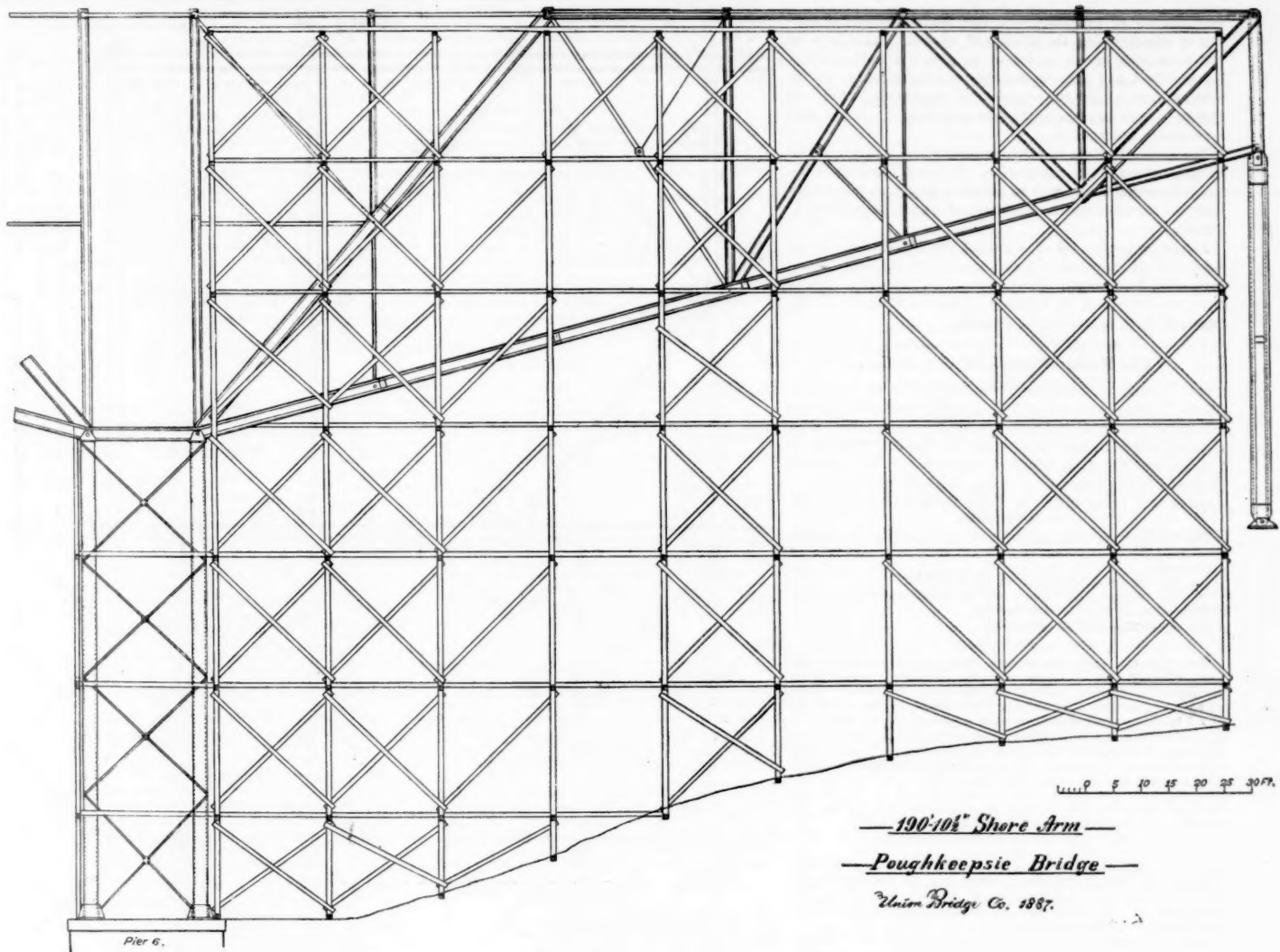


Fig. 10.—False Work for Erecting Shore Arm.

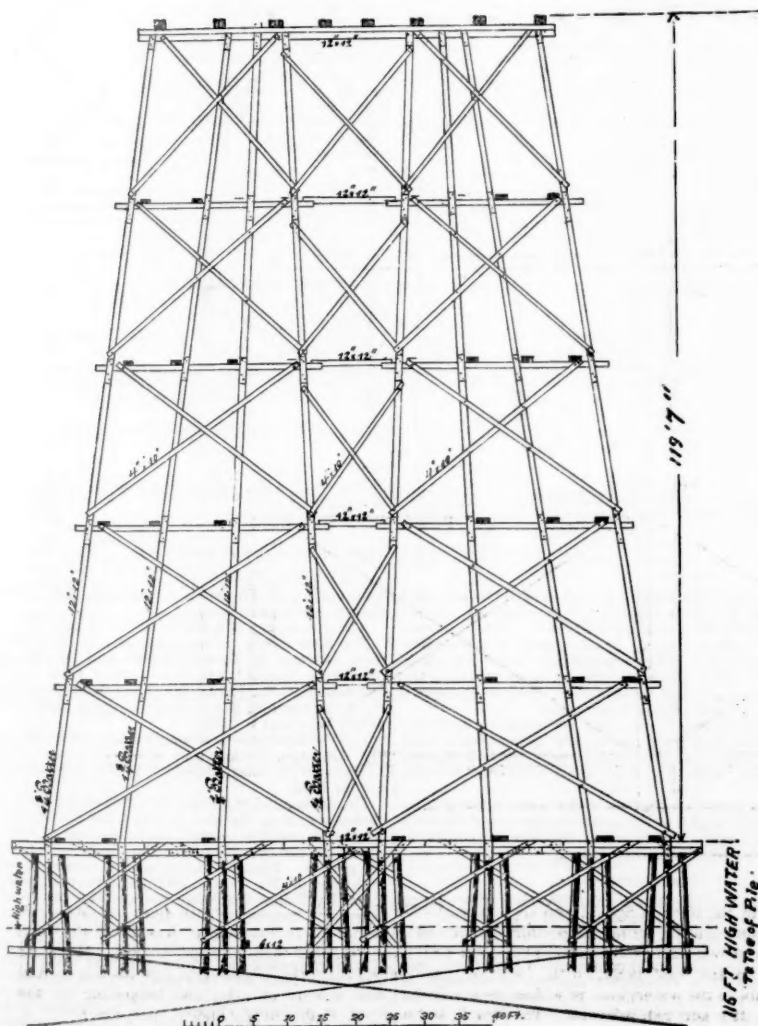


Fig. 11.—False Work for Erecting 509-foot Connecting Span.
POUGHKEEPSIE BRIDGE—UNION BRIDGE CO., ENGINEERS AND CONTRACTORS, 1887.

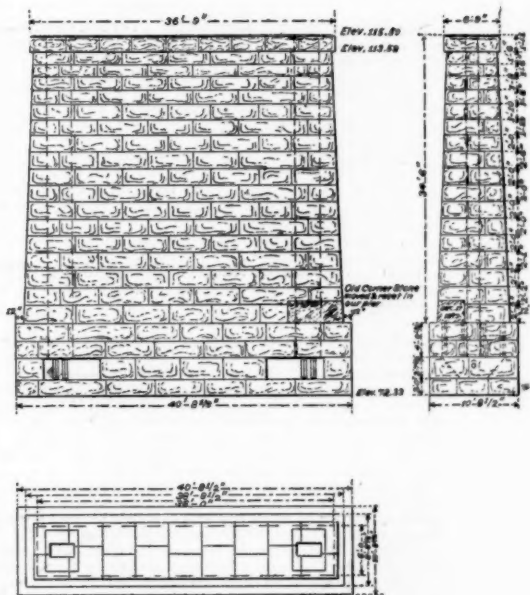


Fig. 12.—East Anchorage Pier.

beams in the base of the pier by eye-bars. The foot-plates of these towers are sunk in the coping stone of the pier a few inches to prevent lateral displacement by a side strain, as from a strong wind, happening at a moment when the weight is taken off this arm of the cantilever.

A corner stone, set in December, 1873, to record the fact that work was begun before Jan. 1, 1874, the limit fixed by the charter, was moved by the Union Bridge Co., with all its records, etc., intact, and set in the east anchor pier, Feb. 22, 1887. The contractors for the whole work are the Union Bridge Co. of New York. The sub-contractors for erecting are Ross, Sanford & Baird; for the masonry concrete and timber work, Dawson, Symmes & Usar; for dredging, the Atlantic Dredging Co.; for the timber in foundations and false work, the United Lumber Co.

The Chilled Wheel Manufacturers' Association.

During the Master Car-Builders' Convention, several of the leading makers of chilled wheels met at the West Hotel and agreed to form an association, for the purpose of discussing questions in connection with the quality of steel wheels, the

The plant comprises a centre-high level track on open timber trestle, carrying drop-bottom cars, delivering their coal on a lower platform on each side of which are the pockets so arranged that delivery can be made into tenders on both sides of the structure. The pockets are very deep, of quick pitch, balance weights, although nothing but extended experience will actually settle such questions.

In designing chutes, the angle for bottom of pocket and apron has always been a troublesome point to settle. A comparison of the various drawings shows the Meehan (Kerr) to

drop 45° from the horizontal, the Clifton 34°, the Baltimore & Ohio 55° with the apron at 37°, the Smart (Kerr) 33°, the Chicago, Milwaukee & St. Paul (Kerr) 30°, their new style being 38°, and the Grand Trunk 36°, the average taken over the 7 aprons showing a dip of 36°.

The cost of labor for delivering coal by chutes is given by Mr. Smart at 7 cents per ton. Allowing for interest, depreciation, renewals and repairs at 20 per cent. per annum on the first cost outlay of \$4,000 for the chutes complete, the cost of delivery per ton will be increased almost 1½ cents, or to a total of 8½ cents per ton on an actual delivery of 175 tons per day.

The first cost of his set of 40 chutes averages \$100 per pocket. The cost as given by Mr. Meehan for delivery by chute, using drop bottom cars and high trestle (somewhat similar to the Baltimore & Ohio) in the slack season when a minimum of 18 tons per day is delivered is 6 cents per ton, with labor at 10 cents per hour. Allowing the customary 20 per cent. on a first cost of \$5,500 and using only the minimum output, it would increase the cost of delivery by 16½ cents per ton; but it should be borne in mind that the business in the slack season far exceeds the average, and that the permanent works are adequate to deal with an expected increase in business, so that they can readily handle 320 tons per day every day in the year (= 116,800 tons per annum), which if divided into the 20 per cent. adds but .04 of a cent per ton to the labor cost of delivery, and the labor cost also would be lessened.

It is probable that in a Southern climate the outlay for repairs and renewals to a wooden structure is far less than in the damp, variable climate North and East, but the same figures for renewals and repairs have been here used to facilitate comparison.

HORSE AND CART.

For delivery into chute-pocket by horse and cart the coal to be shoveled from either car or storage heap, annual contracts are made at 10, 12½ and 15 cents per ton, more than 100 tons per day being delivered when the price is as low as 10 cents. However, it comes directly under our notice that one man and horse can day by day handle 30 tons in less than 10 hours, receiving 7 cents per ton, the ramp being of easy grade, of least possible height and the haulage distance short.

Mr. Allen Cooke (Chicago & Eastern Illinois) describes a chute (probably the Kerr) which he is using at four coaling stations, delivering 230 tons per day, requiring seven men at 12½ cents per hour to handle, making the average cost per ton to deliver 3.78 cents, to which must be added 1½ cents (or say in all 5 cents) for "interest, etc.," at 20 per cent. on a first cost per plant of \$5,031.

This is the lowest figure for chute delivery given in any reply we have received, but it comes no way near the low figures given in the Roadmasters Committee's report, who say, "where coal chutes are used we find a maximum price per ton of 9 cents and a minimum of 4.5, (with) an average of 7.4 cents per ton, (showing) an average (savings) of 12 cents per ton in favor of chutes. The time consumed in taking coal from chutes, one minute, and from other devices, 12 minutes, (showing) a saving in time of 11 minutes for each engine coaled in favor of chutes, and where 3,000 tons of coal are handled monthly, we find a saving in favor of coal chutes of nearly \$4,500 (per annum) over other devices."

TRAVERSING CRAB CRANE.

An ingenious, cheap, and prompt mode of delivery is that used by Mr. E. B. Wall (Pittsburgh, Cincinnati & St. Louis) at Columbus, Ohio, and illustrated in the *Railroad Gazette* (April 1, 1887, p. 214). It comprises a self contained steam crab crane, on a trolley having longitudinal movement over the whole length of an overhead traveling girder, spanning three parallel coaling tracks; the girder having motion on rails carried on trestles 25 or 30 ft. high, one on each side of the coaling tracks. The coal shipped from the mine, in ordinary cars, is shoveled into 2½ ton iron buckets at ground level and the crane lifts one of the filled buckets, moves it over the tender when the latch securing the hinged bottom is released, and the contained fuel falls into the tender. Mr. Wall says "I do not think that this form of coal wharf is the best for all purposes. Coal can be loaded more cheaply where drop bottom cars are used, and the wharf arranged accordingly. At Columbus, however, we receive our coal in straight bottom gondolas, box and stock cars. At certain periods of the year we have to carry a supply of coal on the wharf; at other periods the coal can be loaded direct from the cars into the buckets. In designing our wharf we had to consider these conditions. When the capacity of this wharf is taken into consideration with its first cost, I consider it a very satisfactory solution of the problem. The cost of maintenance of the structure is very light, and it can easily be renewed at any time without interfering with the operation of the wharf. The large timber constructions in general use are very expensive to maintain; they have to be renewed every six or seven years, and while with the drop-bottom cars they can be made to handle coal more cheaply per ton than the crane arrangement, nevertheless when all items are taken into account, I think that the showing would be about equal."

The capacity and cost of operation at Columbus is as follows:

Capacity of bucket in lbs.	5,000
Average weight delivered per engine in lbs.	7,000
Probable maximum capacity with 50 buckets and trestle at present length:	
Maximum No. of buckets dumped per hour (tested)	20
Actual working hours (handling buckets)	21
Maximum number of buckets per month	12,400
Maximum number of tons per month	31,500
Allowing each bucket full of coal, also a loss of 20 minutes in time for each 50 buckets handled for the purpose of supplying crane boiler with fuel, water, etc., which equals about 3 hours in 24. Then:	
Present delivery in tons per month	9,120
Present delivery in buckets per month	5,142
Cost of plant	\$7,700.00
Wages of (2) engineers per month at 18 cents per hour	129.60
Wages of (12) coal-heavers per month at 12 cents per hour	518.40
Wages of (2) men dumping and signaling to crane man per month at 12 cents per hour	86.40
Foreman of wharf (1) per month at 13 cents per hour	46.80
Fuel, oil, waste, water, etc., per month	12.50
Repairs to apparatus per month	5.00
Interest on investment per month at 6 per cent. per annum	38.50
Total operating expenses per month	\$837.20
Cost of coaling, per ton, in cents	9.1
Cost of coaling, per engine, in cents	31.55
Not taking interest on plant into consideration, per ton, in cents	8.7
Probable cost per ton at maximum capacity	6.8
Average length of time for coaling an engine	6 min.

It is possible that Mr. Wall's original plan might be improved by the use of a Gantry or "Goliath Crane," as used in Europe, described and illustrated in Mr. C. J. Appleby's paper on cranes, read before the American Society of Civil Engineers, Oct. 17, 1883. (See Proceedings, p. 374.) This dispenses with the trestle, as the whole crane, with its long vertical legs, traverses on track at ground level. The first cost of the crane would be increased, and there would be an increase in the power required to move it, but the system and storage could, at a few hours' notice, be indefinitely extended at the slight cost of increasing the length of the tracks.

LOCOMOTIVE HOIST.

Another special apparatus is that designed by the late Mr. J. B. Collins (Pennsylvania), illustrated and described in the *Railroad Gazette*. Mr. Strode, of this committee, says it is preferred at Elmira because of the small yard room there available for coaling purposes.

The rate of delivery is one truck load of 2 tons in from 70 to 80 seconds, and 4 tenders have been loaded with two trucks each in 15 minutes 25 seconds, an average of 3 minutes 51 seconds each. This included the time of attaching and detaching chain from the locomotive and clearing the track for another locomotive to enter.

The cost, averaged over the first three months of 1887 (when the apparatus was not worked up to its capacity), is 7½ cents per ton, delivering at the rate of 53.4 tons per day, and requiring 2 men working 10 hours each and one 12 hours, at 12 cents per hour.

STRUCTURAL ECONOMIES.

Our circular did not include any queries as to economies in design or construction of plant, but a few notes can be made from the drawings which accompany this paper.

In manufacturing aprons the Grand Trunk, the Cincinnati, New Orleans & Texas Pacific, and apparently the Baltimore & Ohio use plate iron, stiffened with angle irons; all others use timber aprons faced with sheet iron.

Earlier we have noticed an instance of the use of levers, instead of weights, for balancing the aprons. The Chicago, Milwaukee & St. Paul, who use chains and weights, have an extra weight of oak, which the chain lifts just as the falling loaded apron has to be brought to a state of rest. This may be easier in its action and cheaper than the additional iron weight usually used, but cannot, we think, equal the use of an additional length of stout chain that is lifted only at the last moment, giving a gradually increasing resistance to balance (neutralize) the cumulative energy of the falling apron.

In designing the timber framing there may be a reduction in scantling and a saving in first cost if the chute or pocket be carried well over the outer frame, or beyond the line of posts; as it permits the transverse timbers to be shorter and the posts can then be the more completely utilized in carrying the great weight (due to the stored coal, the coal cars and sometimes a locomotive) that comes upon the structure.

The intermediate flap door of the Clifton pocket dividing it into two chutes would add about \$30 to the cost of each 6 or 7 ton pocket.

On the Baltimore & Ohio the joint at hinge between bottom of chute and apron is open, or only covered by a wire screen, and a guide for the dust and a dust-box inside the timber frame is provided for the fine slack in a way similar to the screening apparatus often used with hard coal chutes. The dust-guide is so finished at top as to form an effective support for the apron in its lowest portion.

CONCLUSIONS.

To summarize, it may be said that with regular coal supply from mine in drop-bottom cars, the cheapest and most rapid delivery is by using high central trestles, from which the coal gravitates into dimensioned chutes, and from the chutes gravitates into tender.

When sufficient land cannot readily be obtained for the long ramp (grade) this requires, the economy of labor and slight injury to fuel is so marked under this system as to suggest the advisability of lifting the loaded mine cars vertically (by some form of power elevator) up to the level of the track on top of the high trestle.

For a compromise system where the daily fuel issues are sometimes taken from cars and sometimes from store heap, either the dipping pocket on truck on chute filled by horse and cart may be used, or if the amount to be stored and lifted from heap be not large, an overhead girder crane as used by Mr. Hall will do. If a Goliath crane be used, the storage is practically limited only by the land obtainable.

For leisurely delivering comparatively small amounts, the platform, or better still, direct shoveling from car to tender, is as cheap as any system known; and if it is desired to lessen the time actually occupied in delivering to tender, a hand crane and buckets on the platform will do so with but little outlay and but slight increase in cost over direct shoveling; in fact, if the use of buckets insures the men being steadily kept at work, the cost per ton may, by use of crane, be lessened.

In closing this report we would say that it is apparent from information received by your committee, that the railway department most keenly interested in the cheap and prompt delivery of fuel, viz.: the Mechanical Department, is not, on many of the railways of this continent, usually intrusted with the design, manufacture, or working of the plant required. This is a mistake, and in the worst case that has come under our notice resulted in the extravagant charge against the department of \$1.25 for each ton of coal delivered.

APPENDIX.

Since the foregoing was written and approved by the committee, we have received drawings illustrating Mr. D. S. Dockstader's side-dump coal-car and oscillating apron, designed to deliver coal direct from car to tender without the use of shovel, and therefore at minimum expense.

It will be seen from an examination of the drawings that the floor of the car inclines upwards from side sills to centre at so quick an angle that, when one of the side flap doors (hung from top rail) has its latch released, the coal will freely slide out.

There are five compartments and five doors on each side, so that each of the ten pockets in a 30 ft. 20 ton car holds two tons.

A ramp and trestle 11 ft. 4 in. high are needed to lift the coal cars above the level of tender, and vertical posts carried up on both sides of the horizontal part of this trestle support metal hinges upon which are swung aprons (of the width of the car pockets) whose purpose it is to guide the coal into the tender. Under normal conditions the aprons stand upright and in line with the posts, thus clearing both tender and car, but the pulling of a short rope swings the apron into position for acting as a guide, and the pulling of a handle locks it there, after which the latch securing the lower side of flap door on car is released.

The first cost for plant and the daily outlay for labor are very light when this system is used, its chief defects (aside from the large yard space taken for the three parallel tracks) being the comparative uselessness of the cars for ordinary freight service on return trip to mines, so that the cars would probably only earn revenue on half their total mileage, if hauling locomotive fuel can by stretch of language be said to be revenue earning service.

Signed on behalf of the Committee,

J. DAVIS BARNETT, Chairman.

The discussion being then opened, Mr. Barnett said that it was a decided improvement to truss the front door of the

chute. Mr. Hickey asked what was the cheapest method of delivering coal on locomotive tenders.

Mr. Barnett explained that altogether depended on the conditions; when the coal was delivered in dump cars and there was plenty of room a central high trestle arranged so that the coal can run directly into pockets was the cheapest, the actual cost of delivering being about four cents per ton, and allowing 1½ cents for interest and depreciation, the total amounted to 6 cents per ton. With this method the coal was not weighed, but the capacity of the chutes can be marked upon them, and when an engine requires a small quantity of coal she can go opposite a small chute. Measuring by bulk was quite as satisfactory as weighing.

When no dump cars are used, and storage must be provided, another system must be used. If with the system of high trestle described above you have occasionally to cart the coal from the storage heap, it will cost fifteen cents per ton.

Mr. Wall's method as described in the *Railroad Gazette*, using a traveling crane, was a very cheap one when dump cars were not employed and storage was necessary. The cost might be reduced by using a Goliath crane, thus dispensing with the trestle.

Mr. Meehan said that in the South they paid for the coal by the bushel, and that it was as good as by the weight. At Meridian, Miss., they paid one-half cent per bushel, 25 bushels going to the ton. Mr. John McKenzie asked how Mr. Barnett proposed to deliver small quantities of coal if the movable portion of the pocket were dispensed with. Mr. Barnett replied that they provided pockets of different sizes. Mr. McKenzie thought the arrangement proposed was dangerous, as the open throat allowed all coal to come on the apron at once, and was likely to injure the men. Mr. Barnett explained that the men should stand to one side when pulling the apron down. All chutes deliver the coal somewhat too far over the coping of the tender, and are apt to spill some of the coal upon the track. The discussion then closed. The report of the Committee on the Preparation of Locomotives was then read.

THE PREPARATION OF LOCOMOTIVES.

The committee on the preparation of locomotives conclude that with boilers that are constructed with reference to being easily accessible to all their interior parts, the best system for washing out is by means of high service storage tank in connection with a stationary boiler and proper piping for blower and blow cock connections, and a steam boiler washer (of which there are several good ones on the market). The live engine to contribute its steam to heating the storage tank and in return when washed to receive its full of hot water from that source. For firing up, they are of the opinion that the present use of wood is to some extent abused, but aside from its storage and handling, it leaves little to be desired from an economical point of view in the majority of sections of this country when properly used in boilers that are filled with hot water and have means provided for artificial draft.

G. W. ETTINGER,)
W. H. THOMAS,) Committee.
T. W. GENTRY.

The following is a summary of the replies received:

Mr. James Meehan (Cincinnati, New Orleans & Texas Pacific) uses 20 x 24 Consolidations, 19 x 24 Moguls and 18 x 24 Americans as standards, with soft coal as fuel, soft water as feed, the deposits of which (one per cent.) are mud, lime and magnesia. Engines loaded full for 70 ft. grade.

He finds it necessary to wash passenger engines after making 632 miles and freight engines 474 miles, the equivalent of four days' service in each case, mud being the main impurity with which he has to contend. Plugs in fire-box legs opposite each arch pipe and under waist of boiler near smoke arch in which to introduce hose.

Jet of cold water at about 30 lbs. pressure he finds efficient means of cleaning his boilers. He considers it desirable to let his boilers get cold between trips, and never permits banking of fires, having them cleaned at the end of each trip. He uses the fire-brick arch and baffle plate and cleans tubes by removing same and using scraper through tubes. Fills his boilers after washing them with cold water, requiring on an average 20 minutes each, and requires one hour to get steam, using ½ cord pine wood, cost 25 cents; uses Greenwade's device for heater and blower: cost to erect for 16 stalls, \$87.49; estimates saving about 20 cents per engine fired.

Cleans tanks periodically at intervals of six months; uses unskilled labor at 12½ cents per hour, supervised by round-house foreman; record kept by round-house man.

Mr. Cockfield (C. & N. Ry.) in a 29 stall engine house uses two No. 58 Nathan boiler washers, washing 7 engines every 24 hours. These are supplied by an upright boiler 48 x 124 inches at 90 pounds pressure, which gives 50 pounds pressure at nozzle through 50 feet of 2½ inch hose, water being warm when entering boiler, can regulate temperature to any point and finds great advantage from the use of hot water for this purpose and for refilling boiler when washed. Does not allow steam to be blown off through blow cock and considers it essential to allow engine to stand two hours after steam is blown off before water is let out; uses oval head pipes and connections to blower and blow cock to use steam from live engines, or stationary boiler to hasten steaming up. Has let water out of 18 x 24 engine, refilling same, and made steam enough to come out of house in one hour and thirty minutes. Can refill boiler in 8 minutes and get 50 pounds of steam in 25 minutes. Estimated fuel consumption to wash out and fire up 330 pounds per engine.

Mr. Barnett (Midland Division Grand Trunk) uses 18 x 28 moguls and 18 x 26 Americans as standards. Fuel soft coal, and every variety of water from hard to softest of brown swamp, lime being its worst impurity but cannot tell proportion. Loads engine to full capacity for one per cent. grades, washes boilers once a week or about once every 1,000 miles. Boilers are supplied with brass wash-out plugs in the four corners of fire-box above foundation ring, in back and front tube sheets and on back head of boiler, also well up on both sides of shell over crown sheets, enabling washers to reach every point with wash-out nozzle. Blows steam and water from engine to be washed into a storage tank, to be used from these for filling boilers that have been washed.

Uses pressure of 60 or 70 lbs. on nozzle for washing. Uses live coal from sand dryer to start fire and trusts to natural draft for same. Does not permit fires banked at terminals. Cannot give cost in money, but estimates the saving from use of hot water at from one to two hours.

Mr. Gentry, Richmond & Danville, uses 20 by 24 Consolidations and 18 by 24 Americans as standards; soft coal for fuel, and surface water as feed. Mud is the worst impurity, the proportion being very small. Sees no advantage in mud drums. Makes it a rule to wash boilers once a week. Allows steam blown

off through blow cock, but at reduced pressure. Has to take down baffle plate or arch to clean tubes, but is experimenting with a combined steam and water washer for this purpose. Uses steam from stationary boiler to heat water and work blower of dead engines. Has a system of underground attachments for connection of blow cock and blower. Does not use steam from live engine for any purpose. Fires up with pine wood; costs 21 cents per engine. Estimates saving over cold water $\frac{1}{2}$ less than wood and $\frac{1}{2}$ of time.

In the discussion which ensued, Mr. Lauder said that these reports were generally a re-hash of replies, but his idea of the proper method of making a report was to take all the facts and embody them systematically in the report, as had been done in the present instance. Mr. Sprague also endorsed the report.

Mr. G. W. Ettinger had asked some electricians if engines could not be lighted up by electricity, or by petroleum, instead of the usual method of using wood and waste. He then read a letter from Mr. M. B. Leonard, who stated that he thought it feasible to use electricity. The coal could be fired by a current, so that in a few minutes the blower could be used. The apparatus ought to be well insulated in order to avoid accidents. The conductor should be flexible, and the whole affair should be small enough to pass through the fire door. They propose to use three pairs of carbons and a low tension current. The discussion then closed.

Mr. Lauder then read a report on the standard diameters of driving wheel centres. Since the last meeting, arrangements had been made with Messrs. Pratt & Whitney to furnish standard gauges. A set of six gauges inside and out would be delivered in cases for \$105. The sizes of the gauges were as follows:

Diameter of wheel centre.	Diameter of tire, inside.	Diameter of wheel centre, outside.	Diameter of tire, inside.
38	37.960	56	55.940
44	43.953	62	61.934
50	49.947	66	65.931

There was considerable difference of opinion as to the proper amount to be allowed for the shrinkage of tires. The usual amount was $\frac{1}{16}$ inch for each foot diameter of the tire, but this rule was a little indefinite, because it was open to question where the diameter should be measured, whether on the tread of the tire or on the inside. The committee, therefore, decided to give a definite difference between the two sizes, that of the body of the wheel and that to which the tire should be bored. The committee also recommended that the Master Car-Builders' standard tire section be adopted for driving tires.

During the discussion which ensued, Mr. Johann stated that his allowance for shrinkage was greater than Mr. Lauder's, but his experience had been in the middle section of the country, where the cold was not so intense in the winter. The committee had therefore adopted a compromise as to shrinkage. He considered one inch flange enough. Others thought $1\frac{1}{2}$ inch, but the committee had adopted a compromise of $1\frac{1}{4}$ inch. Mr. Lauder then moved that the Association adopt the recommendation of the committee with regard to tire sections for all steel tired wheels, engine, truck, and tender. Mr. McKenzie supported the motion, which was carried unanimously.

Mr. Lauder then brought forward some figures as to the strength and properties of tires as shown by experiments made by the engineer of tests, Mr. Hawarth, at the Watertown Arsenal. The tests were made for the purpose of ascertaining whether there is any difference in the density of tires of different thickness, and were made with two Milvale tires, one three inches and the other four inches thick. The results showed that there was practically no difference in density. It was agreed to embody the complete figures in the annual report.

The Secretary then read the report of the Committee on "The Control the Engineer has over the Wear of Tires." Out of 17 roads that had answered the circular, 6 were of the opinion that the engineer had some control over the wear of the tires, and 11 of the opinion that a small quantity of sand should be used. In one case that was quoted, the reckless use of sand gave only half the mileage obtained when sand was used judiciously, and the slip lessened by care. The practice of assigning engineers regularly to certain engines appeared to be general, and gives a saving of 20 per cent. in tires, and probably other parts wear longer in the same proportion. Where one crew is not enough, two crews should be assigned regularly and alternately to the engine.

Mr. Lauder said that the evil of a free use of sand could be well illustrated on the Cape Cod division of his road (Old Colony), which ran through a very sandy district, where they only require the makers of chilled wheels to guarantee two-thirds the usual mileage, because they wear out so fast from sand. Mr. Sprague asked how much sand was furnished to engineers. Some restrictions might be useful. Mr. Sinclair eulogized the report, and stated that there was a great difference between different engineers as regards slipping. The judicious use of sand would prevent slipping better than its free and indiscriminate use. Mr. McKenzie did not stint sand, but showed his men how injurious it was. The wear of the rails at the ends of yards was very conspicuous. He suspended men for the excessive use of sand. What was required was more weight on the driving wheels and better men. Sand was very injurious. He had known a case where two runners ran the same train with similar engines. The careful man who used sand judiciously obtained 60 per cent. more mileage from his engine. Mr. Hickey agreed with the last speaker that even the moderate use of sand was very injurious to tires, but if neither sand nor traction increasers were to be used, what are we to do? You cannot load a locomotive driving wheel for the most unfavorable condition of rail, and consequently sand must be used at certain times.

The discussion then closed and the report of the Committee on the Revision of the Constitution was then read. A minor

ity report, signed by Mr. Setchell, was then read by that gentleman. Mr. Lauder explained that at a committee meeting in New York only two members were present: Messrs. Lauder and Barnett, and that they drafted the constitution read by Mr. Barnett. That the other members did not attend and subsequently Mr. Setchell, who was not present, presented a second draft of the constitution. After some discussion, it was agreed that the committee of five be continued, as it was believed that they would be able if they met in the committee to settle the differences and present a unanimous report, which would be furnished to members at least a month before the next convention. Mr. Towne pointed out that the proposed constitutions having been read as a whole, it was impossible to discuss them, but if they were considered clause by clause it would be very easy to agree at this meeting.

The report of the Committee on the Selection of Subjects for next year was then read by Mr. Blackwell. The following subjects were proposed:

The relative proportion of cylinders and weight on driving wheels to boiler capacity.
Guide bars and crossheads.
Extension smoke boxes and brick arches.
Springs and equalizing gear.
The advantages of thick tires.
The purification and softening of water.
Methods of preventing the escape of live coal from ash-pans.
Tender trucks.
Traction increasers in connection with over-cylindrical engines.

Mr. Twombly retires by expiration of term of office from the Committee on Subjects. Mr. Sprague moved that the salary of the Secretary for this year only be \$1,200, as he had to perform much extra work in consequence of the death of both pre-idents. The motion was carried.

The committee appointed to select the place of the next convention recommended Alexandria Bay, Thousand Islands. Different members suggested Niagara Falls, Montreal and Coney Island, but 62 votes were thrown for the Thousand Islands, out of a total of 69.

The following officers for the ensuing year were then nominated by the committee for that purpose:

President—Jacob Johann.
First Vice President—R. H. Briggs.
Second Vice President—John McKenzie.
Secretary—A. Sinclair.
Treasurer—George Richards.

Mr. Johann thanked the members for the honor they had done him in naming him as President, but for personal reasons did not wish to serve and nominated Mr. Setchell. Mr. Setchell was then elected unanimously. In returning thanks he stated that he joined the Association twenty years ago at their second annual meeting at Pittsburgh and had attended every meeting since, and served under all the presidents. Next year the Association will be of age. He could promise that he would ever be faithful to the Association and would endeavor to answer all questions and never disappoint them. The convention then adjourned to meet at Alexandria Bay on the third Tuesday in June, 1888.

The following is a list of the members composing the various committees, reports of which were read at the convention:

No. 1. Proportion of Locomotive Cylinders.—To give the best results, what rule should be followed for proportioning the cylinders of an engine, when the size of driving wheels, weight available for adhesion, and boiler steam pressure are given quantities:

CHARLES BLACKWELL, Union Pacific.
F. L. WANKLYN, Grand Trunk.
T. E. BARNETT, Canadian Pacific.

No. 2. Traction Increasers—their various types and relative merits, also cases in which their use can be recommended.

R. R. BRIGGS, Chesapeake & Ohio South West.
D. O. SHAVER, Pennsylvania.
T. J. HATSWELL, Flint & Pere Marquette.

No. 4. Steam Packing—the various forms of piston packing in use and obtained results—also the most economical and satisfactory packing for piston rods, valve stems, regulator and air pump stuffing boxes, with results obtained.

J. W. STOKES, Ohio & Mississippi.
ALLEN COOK, Chicago & Eastern Illinois.
HENRY SCHLACKS, Illinois Central.

No. 5. Locomotive Preparation—Washing and lighting up locomotives, showing the best system in use for washing out and most economical and expeditious mode of raising steam, and the necessary plant for same.

G. W. ETTEGER, Chesapeake & Ohio.
W. H. THOMAS, East Tennessee, Virginia & Georgia.
T. W. GENTRY, Richmond & Danville.

No. 6. Coalng up Locomotives—the various plans in use and their relative cost and efficiency.

J. DAVIS BARNETT, Midland Div. Grand Trunk.
JAMES STRODE, Northern Central.
CHARLES GRAHAM, Delaware, Lackawanna & Western.

No. 7. Standard Form of Tire Section.

J. N. LAUDER, Old Colony.
JACOB JOHANN, Chicago & Atlantic.

H. N. SPRAGUE, H. K. Porter & Co., Pittsburg.

No. 8. What Control has the Engineer over the Wear of Driving Wheel Tires?

JOHN MCKENZIE, New York, Chicago & St. Louis.
J. S. GRAHAM, Lake Shore & Michigan Southern.
FRED. B. GRUFFITH, Delaware, Lackawanna & Western.

EXHIBITS.

Among the exhibits shown in the hall of the Hotel Ryan, at St. Paul, during the Master Mechanics' Convention, was

the Nashua foot-guard, the invention of Messrs. Spalding and Adams. It is a wrought iron guard easily adapted to fit any frog, and secured by one bolt only. It is largely used on the Boston & Lowell.

The Smith Cinder Ejector consists of a cast-iron mouth piece and hinged door attached to the lower side of an extended smoke-box. The door is tightened in the act of closing and the device is simple and appears likely to be durable. It is largely used on the Burlington, Cedar Rapids & Northern. These exhibits were in position too late to be noticed in our last issue.

THE STRONG LOCOMOTIVE.

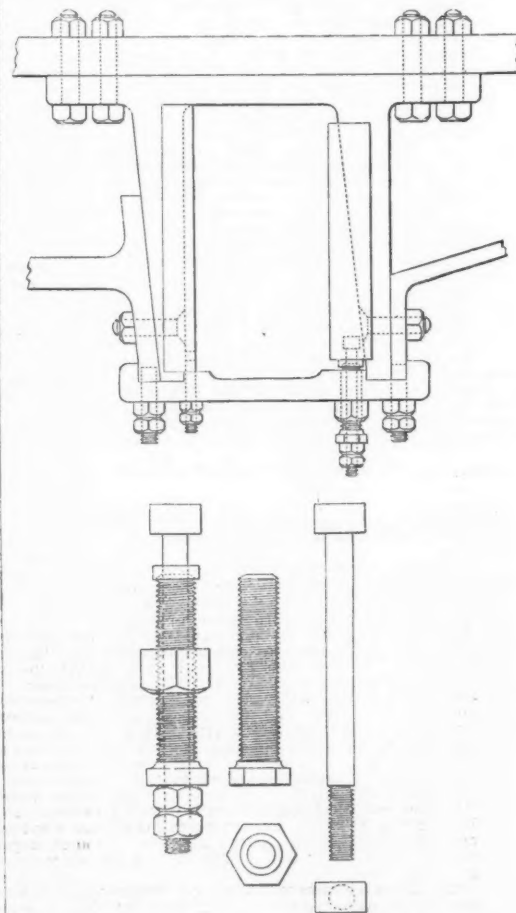
On the concluding day of the convention the Strong locomotive "Dux" (which has been previously illustrated in these columns) was attached to the regular Northern Pacific train leaving St. Paul at 4 p. m. Three extra cars were added for the accommodation of visitors, and many of the master mechanics present at the convention availed themselves of an opportunity to witness the working of this engine. Several indicator diagrams were taken between St. Paul and Anoka, a point 29 miles from St. Paul, where the visitors left the train and returned via Minneapolis. The cards taken did not show a perfect equality of cut-off at the two ends of the cylinder, and the loss of initial pressure and the amount of back pressure were considerably more than had been anticipated. When within four miles of Anoka, and about 14 from Minneapolis, the engine left the train and ran forward for water, entailing a delay of about 25 minutes, which somewhat marred the trip.

The engine hauled the train of 14 cars, including three Pullman sleepers and one dining car, without assistance, her tractive power due to her large cylinder, 20 x 24, and high boiler pressure, 170 lbs., being considerable, while the effect of the separate exhaust valves in diminishing compression materially increases the area of the diagram. The fuel burnt was bituminous lump coal of good quality. The weight of the engine without tender is stated to be 138,000 lbs.

There is a considerable grade for the first few miles out of St. Paul, but the remainder of the run has fair grades. The engine took the regular train of 11 cars on to Brainerd, 138 miles from St. Paul and arrived on time. The engine has since hauled the regular trains on the Chicago, Milwaukee & St. Paul.

Sullivan's Adjustable Lock Wedge Bolt for Locomotives.

The accompanying illustration shows an improved method of securing the wedge for locomotive driving boxes. The object is to keep the wedge and bolt as one solid piece, preventing any lost motion coming between them. In the old-fashioned bolt the head of bolt and wedge wears so as to give as much as from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. vertical play. It is claimed



Sullivan's Adjustable Lock Wedge Bolt.

that this bolt will enable the engineer to adjust the wedge to any desired position, and to lock the bolt so as to hold the wedge rigidly in its place, thus preventing any lost motion or play between the head of the bolt and the wedge. In case it should become worn, he can easily tighten the head of the bolt to the wedge far more securely than is possible with the old-fashioned bolt.

This bolt has been used for five years on the Northern

Central division of the Pennsylvania Railroad, and has proved such a success that, we understand, the Pennsylvania Railroad has purchased the right to manufacture and use it.

The Proportion of Locomotive Cylinders.

The following report of this subject was made to the American Railway Master Mechanics' Association at their recent convention at St. Paul by a committee consisting of Mr. Charles Blackwell (Union Pacific), F. L. Wanklyn (Grand Trunk) and T. E. Barnett (Canadian Pacific). A report of the discussion on the subject appeared in the last issue of the Railroad Gazette.

Circulars embodying questions bearing on the subject were printed and distributed by your secretary, and in addition a few copies were forwarded to locomotive superintendents of Great Britain.

Judging by the very small number of answers received, it would appear that the matter is generally considered a subject well understood, and not open to further discussion. Much difference of opinion must exist, however, or we should not find in examples of modern locomotive construction such variations in the ratio between tractive power per pound of mean effective cylinder pressure, and weight available for adhesion.

Communications in reply to the circular have been received from the following gentlemen: Mr. J. D. Barnett (Grand Trunk), Mr. J. McGrayel (Des Moines & Fort Dodge), Mr. James Meehan (Cincinnati, New Orleans & Texas Pacific), Mr. Angus Sinclair (National Car and Locomotive Builder), Mr. Thomas B. Twombly (Chicago, Rock Island & Pacific), Mr. S. G. Copestake (Glasgow Locomotive Works, Scotland), and from Mr. F. W. Webb (London & Northwestern Railway, England).

Mr. Barnett gives the following rule for finding the diameter of cylinder, when stroke of piston, mean diameter of driving wheels, and weight on same, also boiler steam pressure, are known, viz: the square root of the adhesive power, multiplied by the mean diameter of drivers, divided by the mean effective cylinder pressure, multiplied by the length of stroke, all weights being expressed in pounds and measurements in inches.

This rule requires the assumption of a co-efficient for adhesion, also of the mean effective cylinder pressure. Mr. Barnett, in the example quoted by him, uses one-fifth as the co-efficient, and states that as the work to be provided for is the maximum, the mean cylinder pressure should be fully nine-tenths of the initial pressure, which should be not less than seven per cent. below the full boiler pressure.

Mr. McGrayel states that he adopts practically the same rule, but his experience teaches him that when using a fraction over fifty per cent. of boiler pressure, as the mean cylinder pressure, it is necessary, in order to obtain good results, to use one-sixth as the co-efficient for adhesion, in the case of passenger engines, and one-seventh for freight and switching engines.

Mr. James Meehan reports using the same rule, but assumes ninety pounds as the mean cylinder pressure, in conjunction with $\frac{1}{6.17}$ as co-efficient for adhesion.

Mr. Angus Sinclair gives no rule, but states that the proportion of cylinder and the elements of adhesion are subject to a proper ratio, and that any material deviation from the same should be considered a mechanical blunder.

Mr. Thomas B. Twombly uses the rule in Forney's Catechism of the Locomotive. Multiply the total weight on the driving wheels, in tons of 2,000 lbs., by 5 and then by the circumference of drivers, in inches, and divide by 4, the quotient being the cubical contents of each cylinder.

This rule requires modification to suit the higher boiler pressures now used.

Mr. Copestake uses the same rule, and assumes one-fifth as the co-efficient for adhesion, but uses 63 per cent. of boiler pressure as the mean cylinder pressure. He makes no allowance for wear of tires and takes the diameter of wheels over the tires when new.

Mr. F. W. Webb has no fixed rule, but in ordinary practice adopts a 24 in. stroke of piston, and arranges the diameter of cylinders so that the tractive power at starting, with full boiler pressure, does not exceed the adhesive power under the most favorable circumstances.

Mr. Barnett considers that no deviation should be made from the rule, whether the engine in question be for passenger, freight or switching service. Mr. McGrayel recommends the co-efficient for adhesion to be one-sixth for passenger and one-seventh for freight and switching engines. Mr. Copestake says that the rule should apply to both passenger and freight engines, but in the case of switching engines, the stroke may be longer in proportion to the diameter of the cylinder. Mr. Webb states that he adopts the same rule for both passenger and freight engines.

In reply to question No. 5 of circular, Mr. Barnett states:

"When tractive force is in excess of adhesive weight, the results, although not necessarily bad, usually are so, if the engine is in the hands of but an ordinary engineer, as the engine slipping her wheels so easily, is often allowed to do so, causing not only excessive wear of tires and machinery, but also wasting the steam and throwing away the fuel. Nevertheless, within the narrow limits permissible in locomotive design, the larger the cylinder the more economically the engine can be worked in the matter of fuel consumption. This was the opinion and practice of M. Marie, of the Paris and Lyons Ry., and the experiments then carried out (and recorded in the proceedings of the Institute of Mechanical Engineers, May, 1884) with an eight wheels coupled passenger engine, on mountain service, having cylinders $19\frac{1}{4} \times 26$ in., wheels 49 in. diameter, with about 58,000 lbs. on drivers, show a consumption of 2.88 lbs. of fuel per indicated horse-power or 3.27 lbs. per actual horse-power, and but 30 lbs. of wet steam per horse-power developed. This was achieved with steam at 128 lbs. pressure, cutting off at 19 per cent. of stroke—weight of train 163½ tons, speed 17½ miles per hour, on a continuous grade of 1 in 53½. It is questionable whether such expensive construction is justified where fuel is cheap." He further states: "In other words, an engine having a boiler pressure of 150 lbs., driving wheels of 66 in. mean diameter, and a weight on them of 66,200 lbs., should not have cylinders larger than 17 by 24 in., unless economy of fuel and water is of great importance."

Mr. McGrayel states that when the weight on drivers is less than in the proportion recommended by him, he finds that engines do not give satisfactory results, on account of slipping, which necessitates use of sand, and consequent wear of tires; and when wheels are slipping, and are caught on sand, crank pins and side rods are very liable to be bent or broken.

Mr. Meehan states that the weight on the driving wheels is a point of great influence on the efficiency of the engine, and that the rule quoted by him gives splendid results, as shown by the decreased tire wear. On entering the service of the Cincinnati, New Orleans & Texas Pacific, he found the Northern Division, which is very hilly, with grades of 60 feet per mile, 6 degree curves, and 27 tunnels, stocked with engines which were of the average character as to weight on

CYLINDER CAPACITY AND ADHESIVE WEIGHT OF VARIOUS MODERN LOCOMOTIVES.

Accompanying Report on "Proportions of Locomotive Cylinders."

Passenger Engines.

NAME OF RAILROAD OR MAKER.	Cylinder.		Driving wheels, diameter over new tires.	Tractive power per I. H. M.	Boiler pressure.	Weight on driving wheels.			
	Dia.	Stroke.				Actual.	Calculated.	Excess.	Deficiency.
Belgian State.....	17½	24	79	90.8	142	64,300	43,900	20,400	.....
New York Central.....	17	24	70	101.3	145	52,200	49,800	2,400	.....
Chicago, Burlington & Quincy.....	17	24	69	102.8	140	53,600	48,900	4,700	.....
Chicago, Rock Island & Pacific.....	17	24	68½	105.0	150	52,500	53,300	.....	800
Brooks—1883.....	17	24	67	105.0	140	48,000	50,400	.....	2,400
Great Northern (England).....	18½	28	91½	106.6	140	38,100	50,700	.....	12,600
New York, Providence & Boston.....	18	24	82	110.3	180	79,000	67,500	11,500	.....
Northern Pacific.....	17	24	62	114.6	140	54,400	54,500	.....	100
Chicago, Burlington & Quincy.....	18	24	60	115.2	140	54,500	54,800	.....	300
Lake Shore.....	18	24	69	115.2	180	64,000	70,500	.....	6,500
Old Colony.....	18	24	60	115.2	175	61,700	68,200	.....	6,500
Mason.....	18	24	64	116.9	140	68,000	55,800	12,400	.....
Cincinnati, New Orleans & Texas Pacific.....	18	24	68	116.9	140	60,000	55,800	4,400	.....
Chicago, Rock Island & Pacific.....	12	24	63½	117.4	150	55,000	59,600	.....	4,600
Caledonian.....	19	26	78	120.4	100	68,300	65,400	2,800	.....
Glasgow & S. W.....	18½	26	73½	120.3	140	62,000	57,300	4,700	.....
Great Eastern.....	18	24	64	124.4	140	67,000	59,200	5,800	.....
Grand Trunk (TANK).....	17	24	56	127.3	140	57,200	60,600	.....	3,400
Union Pacific.....	18	26	63	138.1	140	61,000	65,700	.....	4,700
New South Wales.....	18	26	60½	142.8	130	79,000	63,100	15,900	.....
Lehigh Valley.....	20	24	68½	143.3	139	73,400	65,100	8,300	.....
New York, Lake Erie & Western.....	20	24	68	144.4	140	85,300	68,700	16,600	.....
Philadelphia & Reading.....	21	22	68½	144.8	140	71,900	68,900	3,000	.....
Lehigh Valley.....	20	24	62	158.7	160	90,000	86,300	3,700	.....

Freight Engines.

NAME OF RAILROAD OR MAKER.	Cylinder.		Driving wheels, diameter over new tires.	Tractive power per I. H. M.	Boiler pressure.	Weight on driving wheels.			
	Dia.	Stroke.				Actual.	Calculated.	Excess.	Deficiency.
Great Eastern (England).....	17½	24	58	130.1	140	82,000	65,800	16,200	.....
Brooks—Mogul.....	18	24	55½	143.3	140	72,500	72,500	.....	.....
Baltimore & Ohio.....	19	24	60	148.1	140	87,400	71,900	15,500	.....
Brooks—Ten-wheeler.....	19	24	55½	159.7	140	73,100	80,800	.....	7,700
Canadian Pacific.....	19	22	51	160.5	160	90,900	92,800	.....	1,900
Union Pacific.....	20	24	58	171.4	140	105,600	86,700	18,900	.....
Louisville & Nashville.....	20	24	51	193.9	150	97,000	104,700	.....	7,700
Norfolk & Western.....	20	24	50	197.9	140	96,000	100,100	.....	4,100
Pennsylvania.....	20	24	50	197.9	140	100,500	100,100	.....	.....
North-western Pacific.....	20	24	49	202.1	140	97,000	102,200	.....	5,200
Dubs (for Brazil).....	20	24	48	206.5	140	89,500	104,400	.....	14,900
St. Gothard.....	20.47	24	46	226.0	149	114,000	122,000	.....	8,000
Southern Pacific.....	21	36	57	286.0	130	121,600	134,300	.....	12,700
Decapod (Baldwin).....	22	26	45	289.3	140	128,000	146,300	.....	18,300
Johnston's (four cylinder).....	22	18	57	314.6	140	140,000	158,800	.....	18,800

Switching Engines.

NAME OF RAILROAD OR MAKER.	Cylinder.		Driving wheels, diameter over new tires.	Tractive power per I. H. M.	Boiler pressure.	Weight on driving wheels.			
	Dia.	Stroke.				Actual.	Calculated.	Excess.	Deficiency.
Brooks.....	17	24	48	149.2	140	66,000	79,900	.....	13,900
Union Pacific.....	18	26	52	168.5	140	87,700	90,200	.....	2,500
Norfolk & Western.....	19	24	50	178.6	140	94,900	95,600	.....	700

NOTE.—In calculating weight for adhesion, the M. E. C. P. assumed to be 85 per cent. of boiler pressure, and co-efficient for passenger, freight and switching engines, $\frac{1}{4}$, $\frac{1}{4.25}$, and $\frac{1}{4.5}$, respectively.

drivers. These engines were superseded by others of practically the same cylinder capacity, but with greatly increased weight per driving axle, and as a result, the roadmaster reports greatly decreased surface wear of rail, and he himself finds the wear of tires much reduced. He believes this has been attained by reduction of slipping, on account of increased weight on drivers.

Mr. Twombly states that engines in which the ratio of weight on drivers to tractive power is above the average, give better results, the wear and tear of machinery being less, and life of tires prolonged.

Mr. Copestake says he generally takes the ratio of cylinder and adhesive power about equal, but if anything, would give an excess, not exceeding 10 per cent., to the adhesive power.

To illustrate the difference in cylinder dimensions, when calculated by the various rules recommended by the gentlemen who have expressed their views on the subject, the following figures are of interest:

Passenger engine.	
Stroke of piston, 26 in.	
Mean diameter of driving wheels, 61 in.	
Weight on drivers, 60,000 lbs.	
Boiler pressure, 160 lbs.	
Barnett.....	$\sqrt{\frac{60,000 \times 61}{134 \times 26}} = 14.5$ in. diameter of cylinder.
McGrayel.....	$\sqrt{\frac{60,000 \times 61}{85 \times 26}} = 10.6$ in. diameter of cylinder.
Meehan.....	$\sqrt{\frac{60,000 \times 63}{90 \times 26}} = 16.2$ in. diameter of cylinder.
Twombly.....	$\sqrt{\frac{60,000 \times 5 \times 198}{4 \times 26}} = 16.9$ in. diameter of cylinder.
Copestake.....	$\sqrt{\frac{60,000 \times 63}{101 \times 26}} = 16.9$ in. diameter of cylinder.
Webb.....	$\sqrt{\frac{60,000 \times 63}{3.7 \times 26}} = 15.67$ in. diameter of cylinder.
Proposed rule.....	$\sqrt{\frac{60,000 \times 61}{136 \times 26}} = 16.1$ in. diameter of cylinder.

In the consideration of this subject, one has to deal with two indefinite quantities, namely the mean effective steam pressure in the cylinders and the co-efficient of adhesion, and both of these have to be assumed before any calculation can be proceeded with.

The first, or mean effective cylinder pressure, is, of course, primarily governed by the boiler pressure, and is secondarily subject to alteration by point of cut-off and speed—it is assumed that the engine is worked with the throttle wide open, and that the steam passages are of proper dimensions, otherwise the pressure will be influenced by these causes.

Few railways are free from grades which necessitate engines being worked, to a greater or less extent, nearly up to their ultimate capacity, and in the event of starting on such grades, as well as from stations generally, of being worked full power; hence it appears proper that the mean effective cylinder pressure should be placed sufficiently high to cover such cases, and your Committee are of opinion that 85 per cent. of the boiler pressure be considered the mean effective cylinder pressure in the formula.

The second indefinite quantity, or the co-efficient of adhesion, varies as the condition of the surface of the rail changes, and, according to Molesworth, from $\frac{1}{8.7}$ to $\frac{1}{11.2}$, the former being due to a perfectly clean and dry rail; the latter to a slightly moistened, or frosted rail. In different parts of the world it is doubtless possible to find places where the average co-efficient for the year will vary to such an extent as to warrant special allowance being made to suit the circumstances; but in the United States it may be safely stated that exceptional climatic peculiarities, sufficient to justify any material deviation from a standard rule, do not exist.

As passenger engines are worked so as to produce a mean effective cylinder pressure of 85 per cent. of the boiler pressure for a very limited fraction of their total mileage, it would appear not improper to use the co-efficient one fourth, or that due to a dry rail, for calculating the proportions of passenger engines.

Freight engines being worked to their ultimate capacity to a very much greater extent than passenger engines, it would be consistent to increase the co-efficient to say $\frac{1}{4.25}$, and in the case of switching engines, generally worked full stroke, a co-efficient of $\frac{1}{4.5}$ would be required to obviate the excessive use of sand, to prevent slipping on the more or less greasy rail generally encountered in yards where this class of engine is employed.

An inspection of tabular statement herewith shows that among engines of recent construction very great variations in their relative tractive power and adhesive weight exist. In the case of American passenger engines, and using the formula recommended by your Committee, it is found that the N. Y., L. E. & W. Mogul engine, built by the Baldwin Company, has an excess of adhesive weight of 26,600 lbs., or 38.7 per cent.

The eight-wheeled engine built by the Mason Works shows an excess of over 12,400 lbs., or 22.3 per cent.; while the Lake Shore and Old Colony eight-wheeled engines are de-

(Continued on page 442.)



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Elsewhere will be found some account of the work at Poughkeepsie Bridge. It is a remarkable illustration of recent advance in bridge engineering work that such a stupendous structure, carried on with such rapidity and precision, should excite so little comment. The minds of men have become so familiar with colossal structures that spans of 550 ft. and foundations 135 ft. under water are taken by the public as matters of course; and it is only the engineer who appreciates what they involve. The sinking of open cribs, by dredging, to that depth will be watched with great interest. The arrangements for erecting will be studied also, as fine examples of field work. The resources and the mechanical skill of the Buffalo and Athens shops, where the superstructure is building, are in themselves noteworthy. Although the capacity claimed for each is 15,000 tons per year, the Athens works alone are now turning out 1,700 tons a month. The struggle to prevent the building of the bridge will probably now delay matters little if any longer. The one great argument brought against it, that navigation will be impeded by the piers, does not seem absolutely convincing when one reflects that there are three deep 500-ft. channels not to mention the narrower but still deep shore channels. The pilot who cannot get through these certainly has no business on the river. At least two companies have been organized to build and acquire lines to connect the systems of railroads west of the Hudson with those of New England. The Pennsylvania & New England Construction Co. is said to have acquired the control of the Pennsylvania, Slatinton & New England and the Hartford & Connecticut Western, with charters for a line to Springfield. The Port Jervis, Monticello & New York is organized to build a line to bring the Pennsylvania, by its Belvidere division, through Port Jervis, to the bridge.

Mr. Westinghouse has been during the last fortnight making numerous changes in his brake with a special view of making an emergency stop with a 50-car train without shock, even where air alone is used without electricity. The change which has produced the greatest effect in quickening the application of the brake on the last car, and rendering it more nearly simultaneous throughout the entire train is an enlargement of the train pipe to 1½ in. diameter. It is claimed that by this means the brake is applied on the rear car in about two seconds after it has gone on the front car, or in about one-third of the time taken by the apparatus as arranged when the extremely violent shocks were experienced at Burlington in May last. The following results were attained with trains of 45 cars at a private trial at Burlington last week made over the regular course:

Stop.	Speed. Miles per hour.	Distance. Feet.	Time. Seconds.	Movement of sldometer. Inches.
1	18½	155	8½	6¼
2	24½	420	14½	6¾
3	27	175	9¼	¾
4	30½	480	18½	5

These results are very satisfactory, but it may be noted that the distances in which the train was stopped

considerably exceed those obtained with electrical application. The figures given in the report of the Brake Committee were as follows for trains of 50 empty cars electric application, corrected for speed and grade:

	Speed. Miles.	Distance. Feet.
Carpenter	20	111
	40	450
Westinghouse	20	136
	40	505
Eames	20	238
	40	614

The abolition of shock, however, is very desirable, even if gained by the sacrifice of some feet in the distance in which the train can be stopped.

The situation in Manitoba becomes daily more interesting. From the latest dispatches it appears that the Manitoban premier, Norquay, refuses to transmit to Ottawa the bill authorizing the road to the boundary until the work shall have actually begun. That is, he means to postpone till the last moment the disapproval which is sure to come; and it is said that the Dominion government can only prevent the building of the road by force. Naturally, contractors hesitate to undertake the work under the circumstances, and the story now is that the Manitoban authorities have been in St. Paul trying to make arrangements with the Northern Pacific people to take the bonds of the province and furnish the money to build the road. That Manitoba should protest against the effort to secure to the Canadian Pacific absolute control of her trade is quite natural. The people of that province have always been in somewhat intimate trade relations with the United States, and, indeed, many of them are "Americans." Until very lately their only railroad communication was through the states. They are yet nearer to the trade centres of our northwest than to those of Canada, and it is to the United States that they look for that commerce which is to make them a great and rich state. They see immediately to the south a rich country, fast filling up, and certain before many years pass to be the seat of a vigorous population; and only 470 miles away are large cities, already centres of commerce and seats of a high civilization. To the east they see for a thousand miles a wilderness, and in that direction the nearest city which can compare with St. Paul and Minneapolis is 1,400 miles from Winnipeg. It is not astonishing that the people of Manitoba should feel outraged by the determination of the Dominion government to put upon them this tremendous handicap for the benefit of a corporation which bullies them, and in the interest of a people with whom they have only moderately warm sympathy. On the other hand, it was the deliberate intention of the Dominion government to give the Canadian Pacific the monopoly of the trade of Manitoba and the Canadian Northwest. One of the very heavy conditions imposed upon that road was that it should build the long, unproductive line from Winnipeg, north of Lake Superior, through the province of Ontario—a wilderness region which can yield no paying traffic for years to come—and it was part of the compact that no other company should build a railroad within 25 miles of the United States frontier. This was not an unreasonable requirement on the part of the company. The financial venture was a hazardous one, and with all the government aid the money was raised only with much difficulty. The people of Manitoba knew the situation when they went there, and the present view is rather unseemly on their part. It is a little like kicking over the ladder by which one has climbed up. But the talk of violence or armed resistance is foolishness. The Dominion government may see some ground for changing its policy, but if it does not the people of Manitoba are helpless. A revolt because they are not allowed to build a railroad would be a new kind of revolution. It would have some claim, too, for consideration, as a patriotic movement, but it would be wildly preposterous. There is a railroad now from the seat of power right through the heart of the discontented region. That fact alone should be enough to end all lawless talk. Canada has a fine militia, and her light batteries are even celebrated. It is a pity, both for Manitoba and for our own Northwestern railroads and cities, that the Northern Pacific or any other company cannot build lines anywhere it chooses in the provinces, but the action of the Dominion government is not wanton tyranny. It is the carrying out of a contract.

The verdict of the Coroner's jury on the collision at Havre de Grace, Md., June 21, is a curious combination, though not more curious perhaps than the majority of such documents are. A fast north-bound train approaching the end of the double track at the southern end of the long bridge over the Susquehanna crashed diagonally into the side of a slowly moving

south-bound passenger train that was just passing from the single to the double track. The engineman acknowledges that the (interlocked) signal was against him, but says the brake would not hold. The regular speed of the train is about 60 miles an hour, and according to the testimony it was moving at about one-third of that rate when it struck the parlor cars of the other train. One passenger was killed and 20 injured.

The Coroner did not elicit any intelligible information from the engineman as to the cause of his failure to stop, and it is still unexplained. This road (the Philadelphia, Wilmington & Baltimore) has a high reputation, and we suppose, of course, that the train had the Westinghouse automatic brake, and that it had been duly inspected and cared for; but the only light on this point is the runner's statement that the brake failed to hold because of "leakage under the train;" and he talks about "putting on the pressure" as though he were using the straight air brake. If this man were not spoken of as an old passenger runner we should conclude that he was unfamiliar with the automatic brake; and as it is, his statements need clearing up. A hostile critic would be inclined to the presumption that he simply failed to apply his brake soon enough. He was behind time and quite likely running nearer 70 miles an hour than 60.

The jury, however, instead of getting at any facts concerning the actual speed at which this train approached, or was in the habit of approaching, or trying to make any connection between its premises and its conclusions, goes off into generalities as follows:

"We do censure the railroad company and its employees for the reckless manner and high rate of speed in running through our city, thereby endangering the lives of our citizens and the traveling public."

And it appears that the railroad would quite likely have been censured for maintaining a track through the town (and for existing at all) had it not been for one sensible man who restrained the other eleven.

The bridge being single track makes the approach to it as dangerous as an ordinary grade crossing, and indeed more so; so that derailing switches would seem to be advisable if numerous passenger trains are to approach at very high speeds.

The testimony brought out the fact that the time allowed for crossing the bridge, ¼ mile in length, is three minutes, but that delayed trains frequently run the distance in 63 seconds, it being a favorite spot for making up time. The conductor testified, according to the reports, "I did not see the red signal. It was my duty to do so, but it is an utter impossibility for conductors to look for such signals all the time. I was busy attending to other duties in the interior of the train." A bridge of this length, to be run over at fifty miles an hour, should have an exceedingly good floor system and very stout guard timbers; and trainmen who will not obey orders, as in this matter of speed, or who cannot, as is claimed in the conductor's case, ought to be looked after. The claim that derelictions are hard to ferret out certainly cannot have much weight here.

THE QUALIFICATIONS OF SUPERINTENDENTS.

A railroad manager on intimate terms with a certain president of another road lately had as a protégé a young man, desirous of entering the railroad profession, who wanted to begin in the service as station agent or in some other ordinary capacity with a view to "working up." The manager asked the aid of this president, and received a reply the substance of which was that station agents were already plenty enough but that one or two ready-made superintendents would find a quick market with him. Not long ago a superintendent was complaining that in the matter of taking young men into his office with a view to training them for responsible positions his experience was very unsatisfactory; they did not appreciate their opportunities, or lacked industry, or in some other vital condition fell short of the proper standard.

Now, what is the matter? One man fails to find the material to work upon and the other finds that which he does work upon poor. It is the old story of "plenty of room at the top," but not enough men with the courage to occupy it. This is not new in railroad experience; but as the railroad system grows and more imperatively needs the best grade of talent in its management the want becomes more pronounced. Heretofore the shrewd manager who found that good men were scarce has waited until a genius turned up by chance, and in former years he did not have to wait very long; but there are indications that the supply of geniuses does not grow as fast as new railroads are built. That the supply of good men is scanty and cannot be made to cover the field without spreading it too thin is shown by the fact

that the best ones on large systems do not make their influence felt throughout the whole system. We hear, for instance, that the Vanderbilt system has secured a certain man of well-known attainments for a specific office, and yet valuable changes or improvements brought in by him are seen to be only partially or imperfectly carried out; or again, practices are seen to be continued on certain portions of the Pennsylvania system which have been bettered on other portions, and would most certainly be on the whole if the individuals who have studied the situation could make their influence sufficiently felt. A superintendent of even the most ordinary qualifications has no trouble in finding an opening if he accidentally loses his place.

The first difficulty is that too much is demanded; too many of the positions can only be filled by a man possessing what the theatrical people call protean accomplishments. The successful man must be a doctor, lawyer and minister combined, with several newer professions added. He must have worked in the West and in the East; must have been on new roads and on old ones. He must have been a track repairman, a freight brakeman and a telegraph operator in order to intelligently superintend these departments. He must have had experience in building railroads so as to know the nature of the ground he stands on, and be able to project new branches: he must be a skillful buyer and seller so as to know the value of every kind of merchandise from pig-iron and ice to electricity and options in stocks. He must be an expert accountant so as to select men good at figures for station agents, and must possess a general knowledge of men so as to pick out a good agent from a dozen thirty-dollar candidates. Moreover, he must have unlimited suavity and "tact" in dealing with disagreeable people so as to at once infuse a large quantity of this quality into these \$30 men. He must be polished enough to represent the road before legislatures and courts, and to entertain Queen Victoria or Emperor William if they happen to pass his way; and at the same time must be "practical" enough to successfully deal with a mob of rowdy brakemen on a strike. And it goes without saying that above all these he must have that nicely balanced general judgment which will enable him to properly combine the various topics in his regular mental habit, and know how large a portion of his time and strength to devote to each.

This is overdrawn, of course; many roads have learned better than to expect everything of one man; but many, especially of the smaller ones, still stick to the old ways. And of the larger systems which have multiplied their first, second and third vice-presidencies and other high offices, some have simply transferred the burden from a lower office to a higher one. The man and his title have been elevated one or more steps, but too often he has taken the bulk of his work along with him instead of leaving it for his successor in the lower position.

And what have the owners of this vast property, requiring such skillful management, done toward securing a supply of talented men to perform these exacting duties, and to fill the new and complex positions that grow out of the constant increase and development of the business? Almost nothing at all. Moreover, if the superintendent expects to ever fill a higher position where he must deal with "traffic" questions, which he may have been hitherto measurably relieved from, he must qualify himself as best he can while engrossed with his regular duties. In short, the great American railroad university is open only to men who have already assumed the burdens of life; the students are wholly those who should have been graduated several years before. The plan of allowing men to qualify themselves for their positions after they take them, instead of before, which obtains so widely in the lower grades (enginemen, conductors, station agents, etc.) is really to a large extent followed in the higher circles.

It is the pride of American civilization that it is intensely practical; wasting one's life in spectated search after book-learning, or pottering forever over details that the business has outgrown, we boast that we are not guilty of; but in going to the other extreme we must be careful lest we run off the track. There is no getting around the fact that theory precedes practice, whether we discern the relations in each case or not; and if we expect to always have our practice healthy, enterprising and vigorous we must give some attention to this pre-requisite. The best time for men to learn is when they are young. With 140,000 miles of railroad the training school for the men to manage the business must be something more substantial and trustworthy than sufficed twenty years ago, in order to keep up an adequate supply; and it is high time that more attention were paid to it.

Of course it is easy to say that the idea of a technical school for the education of officers of this kind is chimerical, and wholly out of the question. Perhaps it is; but that does not dispose of the matter. The fact to be remembered is that under existing circumstances young men of proper natural abilities do not qualify themselves fast enough to fill the places that are waiting for them. Whether an outside school should be established to give diversified training before the young man enters upon his active work, as is done for engineering and mechanical professions; or a larger number of subordinate offices should be created in the operating departments, so as to have a better range of choice in selecting; or larger salaries should be paid in the lower grades already in existence, so as to attract better men to this branch of service, are questions that indicate some of the possibilities that are open to those who really wish to inaugurate improvement.

Technological schools like that of the Baltimore & Ohio are excellent, but only cover a part of the ground. Courses of university lectures on the science of railroading are good as far as they go, but do not seem likely to overstock the market just at present. The old apprentice system is nearly obsolete in the mechanic arts, and substitutes for it are being broached or adopted; but in the line now under discussion, we seem to be still far in the background; to advance even to a healthy apprentice system would be a distinct improvement. There are, to be sure, other important lines of business in which the rule of thumb is still followed, but that is no warrant for its continuance here. The making of successful merchants is a line of education not subject to formulated rules, but that does not prove that it ought not to be; moreover the large number of more or less unsuccessful buyers and sellers may be owing to the prevalence of this empirical method. An unsuccessful railroad superintendent is an expensive experiment.

The Pennsylvania road has for some years set a good example in its well arranged system and its intelligent promotions, and this example has to some extent been followed; but so long as the following is no greater than now the pioneer is repaid for its beneficent action by seeing its best men frequently picked away by other and less "forehanded" roads. This difficulty will always exist to a certain degree, for obvious reasons; but the only way to counteract it is to take action in all three of the directions just alluded to. Theoretical teaching of the various lines in which a superintendent must be proficient is necessary, because the rudiments and ground work of the profession can never be learned so profitably as when the candidate is young (and unqualified for responsible service.) The number of subordinate supervisory positions should be increased so as to give better opportunity for changing young men from place to place, and to make it more certain that there shall always be a supply of candidates of sufficiently varied experience. The pay of under officers should be liberal, so that they shall not become discouraged if they have to wait an unusually long time for the higher position which they are looking for, and also for the purpose of keeping in the service young men who are able and ambitious, but poor. In the older portions of the country it would be no very difficult thing to raise up in a few years a body of qualified men for managing positions from among the sons of men of sufficient means to provide for the necessary training largely or wholly out of their own pockets; but in the country as a whole this would not work so well; and self interest as well as justice to the rank and file demand that young men of moderate means be given a fair chance.

Disabled Passengers.

In speaking of "disabled passengers," we refer to the various classes of persons who travel by railroad without attendance, although they lack some of the natural powers useful to a traveler in avoiding accidents and disasters. There are many such. Every car carries aged and infirm, ill and feeble persons; some blind or deaf or lame man; some child whom the adult passengers instinctively pronounce "too young to travel alone." What rights are peculiar to these passengers? What duties, if any, different from those due to ordinary persons, are owed them by the trainmen?

It is well settled in law that these disabilities do not deprive a person of his right to claim the benefit and aid of the railroad in prosecuting a journey. He takes a somewhat different risk from that assumed by the person of ordinary powers; but his right to purchase a ticket and to take a seat is not abated by his disability. Miss Laura Bridgman, taking passage, paying fare and behaving properly, could not lawfully be put off the train by the conductor, because he deemed it

dangerous for a deaf, dumb and blind woman to travel alone. An intoxicated man cannot be denied a ride merely because he is intoxicated, though he will quickly forfeit his right if his intoxication disturbs his fellow-passengers. Perhaps a person obviously suffering with a contagious disease is the only one who can be excluded from the cars merely on account of his physical condition, and he is excluded solely because the safety of the traveling public requires it, not at all on account of his own. The right of a well behaved fare-paying passenger, taking his own risk to travel, is almost without exception.

An instructive case was decided in Missouri. The passenger was a man who had been arrested by the marshal for crime; and in making the arrest he had been fatally shot. The marshal and his party brought him lying on a lounge to the cars, paid for his ticket and put him, against his remonstrance, in the car. With the party came the prisoner's wife, who joined in his expostulations. When the conductor came on his rounds, he at first refused to carry the wounded man; but, on being told of the arrest and of the marshal's authority, he retracted his refusal. The prisoner died of his wounds soon after reaching the end of the trip, and the widow sued the company under a law giving damages for wrongfully causing death. The Court said that this was probably the first case of the kind, but they sustained the conductor. They said that his act had perhaps hastened the death, but had not caused it; the shooting was the cause; therefore the case was not within the law. As to the conductor's decision to carry the man against his will, the Court said that he could not be blamed for that without requiring a conductor, when a sheriff brings a prisoner to the cars to take him to prison, to organize himself into a court and to try the question whether the man was duly arrested. The Court did not say that conductors are bound to carry prisoners who object, but that the presence of the marshal with the papers and apparent authority, and his request to carry the prisoner, justified the conductor in keeping him on the train. They also said that if a conductor knowingly carries a person against his will, without some such legal right, it is the conductor, not the company, who is liable.

Speaking of carrying unwilling passengers reminds us of a case narrated in the *Railroad Gazette* of Dec. 22, 1882. The "unwilling passenger" was a boy of ten, who was detected by a brakeman taking peaches from a crate in a fruit car. The brakeman arrested the culprit and sentenced him to solitary imprisonment—in other words, locked him in the caboose car. After the train started, the boy's cries attracted the conductor's attention, who inquired into the case, and so far ratified the brakeman's action as to decide that the prisoner be carried to the next station. Here he was released, five miles from his home; and the alarm, excitement, confinement and over-exertion of returning on foot brought on a severe illness, for which brakeman and conductor were sentenced to \$1,658 damages. The Court said that the conductor ought to have stopped the train when he first discovered the stowaway, and released him.

In general, neither childhood nor age, illness nor deprivation of senses, impairs the right to become a passenger, but these may make much difference in the risk which the passenger assumes. We understand the general rule to be, that in so far as the disability of a passenger is not apparent, nor known to the trainmen, the company is not responsible to take special care for his safety. But in case of a little child, of a person obviously aged or infirm or lame, such must be treated with more care than ordinary passengers.

In a Kansas case, a passenger of drinking habits was attacked during the trip with a fit of delirium tremens, and became noisy, rude and disorderly, tried to jump from the train, pulled off his shoes, declaring they were full of bugs and worms, frightened the passengers, and finally fell down in the aisle of the car unconscious. The conductor, on reaching Newton station, put the undesirable passenger off the car. In the lawsuit which arose the Court held that the conductor was fully justified in his action. It is one of the duties of a railroad company to secure their well-behaved passengers against annoying and disorderly conduct of other passengers, and when the behavior of one is such as renders him dangerous or seriously disagreeable, it is not only a duty but a right to put him off. But in this case the trainmen did no more than to lift the man out of the car and lay him down upon the station platform. They made no arrangements for care, shelter or attendance, but returned to the train, leaving him to whatever fate might befall a man lying stupid with intoxication, exposed in a cold night, in a place where no one knew him or his condition. He lay an hour or two when the city marshal was notified and

took him in charge; but he died of the exposure. The Court said that the manner of removing the man from the train was inhuman and unlawful. The trainmen could not lawfully leave him on the platform exposed and helpless. They had the right to remove him from the car, and the company was not bound to keep a hospital and nurses along the road for the benefit of sick or insane passengers. But when the agents of the company decide to exclude a passenger who, during the journey, becomes helpless, they are bound, so said the Court, to exercise reasonable care to make temporary provision for his safety.

Many decisions show that the managers of a train are bound to take reasonable notice of any obvious disabilities of a passenger, and to give him such care as he needs. Passengers are not cattle, to be carried all alike, but so far as there are variations in their ability, conductors and brakemen should take notice and give care.

But another form of the question arises when the company alleges "contributory negligence" on the part of the passenger. If the passenger disregards his disability and voluntary does what is perilous for him, though perhaps it might be done safely by the well and strong, he contributes to the casualty, and the risk is upon the passenger.

In a Maryland case, a woman having two young children in her care, and herself heavy with pregnancy, wished to stop at Tuscarora station; but the cars only "slowed up." The conductor roughly hurried her to get off. She asked him how. He answered, "jump." She jumped, holding in her arms the youngest child; and owing to her condition was seriously injured. The Court held that the lawsuit turned on the question whether the passenger in jumping, under the circumstances, was chargeable with contributory negligence; that is, was herself partly in fault. And after laying down what is rather a severe rule and high standard for conductors, "that they are presumed and required to have ordinary eyesight, so that they can distinguish between a man in the vigor of life and a woman in a state of pregnancy accompanied by young children," they said that when the conductor advised the woman to jump, he cast the responsibility and risk of her doing so in her enfeebled condition upon the company; she was not to blame.

In Texas, owners of some horses sent them by car in charge of a lad of ten years, giving him a "drover's pass" for his fare. This pass bore the words that "minors should not be allowed" to travel under such passes; nevertheless the boy was allowed to ride upon it. The cars reached Marshall, the destination, during the night, when the conductor awakened the boy out of sleep, saying "Marshall! Get ready to get off. I am just going to pull you to the stock yards." His intention was, after allowing other passengers to stop at the station in the town, to carry the boy and horses somewhat further to the stock yards. But the boy knew nothing of the place, and when the train moved onward and, intermediate between the station and the yards, made some little accidental stop, he supposed that it had reached the yards and that he was to alight. But just as he attempted to do so the cars gave a start, he was thrown off, and the result was he lost his arm. The Court held that, notwithstanding the words in the pass about minors, the company, if it accepted the pass, was bound to give the boy the care proper for a minor and a stranger, and that the lad was not in fault in attempting to alight as he did.

The "long-and-short haul" of this subject is, that disabled persons have the same right as those who are strong and well to travel by railroad, at their own risk; that if the disability is apparent, trainmen must give them the appropriate attention and care so far as the exigencies of railroad service permit; must call the stations plainly and patiently to the deaf; must point the way to the passengers' room clearly to the blind; must help the lame or aged down the steps; that the disabled passengers must in their turn take care of themselves; that is, must take the care and exercise the caution which a prudent person under the same disability would ordinarily use.

Petroleum Fuel.

In these days of sharp competition and cheap transportation among the railroads of the country, when every item connected with the cost of transportation is being looked after as closely as possible, it is natural that the fuel account should receive much attention. On the large railroads of the country, perhaps no single item is a more continuous or more weighty burden on the gross earnings than the cost of fuel; and the railroads welcome any devices that have a tendency to reduce this heavy expense. The Pennsylvania Railroad, with that liberal scientific spirit which has done so much to improve technical practice, has for the last ten years examined and experimented with nearly every device that has been brought forward, with the end of fuel economy before

it. Especially have experiments been made with the view to utilizing as fuel the enormous store of petroleum which is found in this country.

Only indifferent success has heretofore been met with in attempting to burn petroleum, either crude or reduced, as a means of generating steam. Many of the devices offered by inventors were only partly worked out, many had inherent defects which made them failures on trial, and it is only recently that a device has come forward which promises to be a success. The history of the devices for getting heat by burning oil is a very curious one. Not a few have attempted to convert the oil into gas and burn the gas. Others have attempted to simply vaporize the oil and burn the oil vapor. Some of them had a separate appliance located on the tank, or elsewhere on the locomotive, to convert the fuel into a condition to burn; while others put their appliances into the fire-box, where the heat was so great that the decomposition of the oil resulted in deposited carbon, which clogged up the burners. It remained for Mr. Thomas Urquhart, a Scotch man by birth, and who is at present Locomotive Superintendent of the Grazi-Tsaritzin Railroad, in Southeastern Russia, to develop the first successful scheme of using petroleum as fuel, at least on locomotives. Avoiding the errors and mistakes of previous inventors, Mr. Urquhart has devised a scheme which, like all great things, is extremely simple, and at the same time is very successful. His device can be applied to any locomotive boiler or, indeed, to any stationary boiler; of course, with modifications, which are easily made, to adapt the essential features of the device to the boiler in use, and it seems to work equally well with boilers of almost any construction.

The essential features of Mr. Urquhart's scheme of burning petroleum consist in converting the oil itself into a finely divided state or spray, by means of a jet of steam or compressed air, and then burning this spray in the fire-box of the locomotive, in a fire-brick furnace constructed inside the fire-box. The burner or spray producer, if it may be so called, is essentially two tubes, one inside the other, the inner tube carrying the jet of steam or compressed air, and the outer tube carrying the oil. The oil tube is prolonged some distance beyond the steam tube, to allow the steam and oil to combine, and then the two together are projected from the end of the oil tube into the fire-box by the force of the steam. A single burner weighing, perhaps, 40 lbs., is sufficient for a locomotive of the largest size. The fire-brick furnace inside the fire-box is very simple in construction, and may be crudely compared to a bonnet, with the open end of the bonnet toward the injector or spray producer. The object of fire-brick is to receive the small particles of oil that escape combustion before they reach the fire-brick bonnet, and break them up so that they may be consumed. The bonnet furnishes, also, a combustion chamber for the proper mixing and burning of the oil and air; and serves another very important service, in that the fire-brick becomes intensely hot and radiates heat to all parts of the fire-box, and at the same time serves to rekindle the oil after it has been shut off for a short period from any cause, as stopping at stations.

A representative of the Pennsylvania Railroad visited Mr. Urquhart in Russia last year, and brought home a trial burner and drawings. During his absence the published papers of Mr. Urquhart on the subject became available for use, and this information was turned to account. As the result of these two sources of information, a locomotive was fitted up at the Altoona shops in December last, and has been experimented with more or less since that time. It will be readily understood that the conditions in this country and in Russia are somewhat different. American locomotives are worked much harder, and consequently burn more fuel per hour. Moreover, the construction of locomotives is not alike, and it has taken considerable experiment and modification to adapt Mr. Urquhart's plans to American locomotives.

These modifications apparently have now all been made, and a perfectly successful trial trip from Altoona to Pittsburgh and return was made on June 17 and 18. The engine, No. 408, going west, took the mail train, and coming back took the second section of the day express. On the return trip, with a heavy train, the engine made up 25 minutes on schedule time, and in no case did the steam pressure fall below 110 lbs. Most of the time it was just on the verge of lifting the safety valve 125 lbs. When the pressure did fall to 110 lbs., it was after a long pull on the western slope of the mountain, when both injectors were put on to replenish the water supply, which had become a trifle low during the long pull. The amount of oil consumed during the trip east was 3,897½ lbs., and during the trip west was 3,334¼ lbs. In both cases considerably less oil was consumed than was thought to be necessary for the trip.

The working of the device on the locomotive is in every respect charming. One is first struck by the absolute freedom from smoke and cinders. The work of the fireman is limited to the management of a hand wheel, and there is the most perfect relation between the amount of steam consumed and the amount of oil burned. A slight turn of the hand wheel, allowing a little more oil to go into the fire-box, produces smoke; a slight turn in the opposite direction relieves the smoke. A movement of the reverse lever one notch, thus causing a less steam to go into the cylinders, shows instantly in a little smoke at the smoke-stack. This is at once relieved by turning the wheel and allowing less oil to go into the fire-box. A movement of the reverse lever in the opposite direction, working the engine a little harder, causes the steam pressure to fall a trifle. The ever ready wheel and the constant watchfulness of the fireman give more oil and the steam pressure is regained. Oil burning is absolutely ideal firing. To one riding on the locomotive the slight rumbling due to the rapid combustion of the oil, and an occasional glance through the peep-hole into the white hot

fire-box, are the only evidences of fuel consumption. The dirt, dust, smoke and cinders, and the constant opening and shutting of the fire door are all absent.

The experience of the Grazi-Tsaritzin Railroad in Russia, which now has 143 locomotives burning petroleum, by the same method as above described, and the experiments already made on the Pennsylvania Railroad, make it safe to assume that the technical part of the problem of oil burning is solved. It is entirely possible to burn petroleum successfully as fuel for steam generation, and experiments have been in progress for some time for its use for a number of other purposes. In view of this possible use of petroleum largely as fuel, the question of economy becomes very important. The following simple data which are the results of careful experiments, and which also are confirmed by the chemical composition of both coal and oil, may be safely trusted. The heat producing power of a pound of petroleum is as great as the heat producing power of 1½ lbs. of coal. In other words, one pound of petroleum successfully burned will generate as much steam under the same circumstances as would be produced by the burning of 1½ lbs. of coal. In locomotive practice, taking into account the cost of handling the fuel and disposing of the ashes, and also taking into account the diminished repairs to the locomotives, especially to the fire-boxes, due to oil burning, it is found as the result of a year's trial, that a pound of oil is as good as two pounds of coal. In brief, these two ratios may be described by saying that, weight for weight, oil is to coal as 1 to 1½, when fuel account alone is considered, and oil is to coal as 1 to 2 when all the ascertained economies are considered. The reduced oil which is preferred for use in steam generation, weighs on the average a trifle over 7.3 lbs. per gallon; or supposing a barrel of oil to consist of 42 gallons, and to weigh as above stated, 6½ barrels of oil make a ton almost exactly. The price, therefore, of 6½ barrels of oil, is the cost of a ton of fuel oil. This cost per ton being divided by 1½ gives the equivalent price per ton of coal when fuel account alone is taken into consideration, or divided by two gives the equivalent price of coal per ton when all the ascertained economies are taken into consideration. A very simple rule to follow is as follows: Multiply the price of oil per barrel by 3.71 and the product will be the equivalent cost per ton of coal when fuel account alone is considered. Again multiply the price per barrel of oil by 3½ and the product will be the equivalent price per ton of coal, when all the ascertained economies are taken into consideration. As above stated these figures are based on a trifle over 7.3 pounds per gallon for oil, and 42 gallons per barrel. If heavier or lighter oil is used, or the quotations are made by the gallon, it is evident that the figures must be varied accordingly, but the above data may fairly safely be trusted in working out the relative economies of oil and coal for fuel.

As to the possibility of any large use of petroleum for fuel, the outlook is not very favorable. The Pennsylvania Railroad alone burns 8,000 tons of coal a day, and if this fuel consumption should be changed at once from coal to oil, it would consume over one-third of the total daily oil production of the United States. This of course makes any very extended use of petroleum as fuel, with present supply, out of the question. On the other hand, to a limited extent there is unquestionably a field for petroleum as fuel. In places where the nuisance of smoke and cinders is very great, or where the item of transportation is a large element in the cost of the fuel, or where the handling of fuel, and especially the disposal of the ashes are important items, there is unquestionably economy possible by the use of fuel oil. The figures given above will enable any one to work out the problem for his own locality. The natural effect on the oil market of burning large quantities of petroleum, would be to cause an increase of price, and this will probably be the first result. But it is apparent that, at present prices even, say, two or three cents per gallon, the chance for fuel oil is small, leaving out of question the possible supply. There are a few places in the country where oil at present quotations can be used with economy as fuel, but if the oil refiners put up the prices anticipating a large demand for fuel oil, they will certainly defeat themselves, and make the use of oil as fuel uneconomical compared with coal.

It should be stated here that the use of crude oil for fuel is not recommended for several reasons. First, crude oil at the same price per gallon is very much less economical than the reduced oil, because of the less weight. Second, the crude oil constantly gives off gases, which it would be almost impossible to hold, and dangers from explosion would result. Third, the crude oil is very much more offensive so far as odor is concerned. Fourth, the relative proportions of carbon and hydrogen in the reduced oil only vary one or two per cent. from these proportions in the crude oil, so that although crude oil is much more inflammable than the reduced oil, its heat producing power, pound for pound, is very little if any in excess of the reduced oil, and as above stated the reduced oil weighs from one to two pounds more per gallon than the crude oil.

Should any considerable demand spring up for fuel oil it is entirely possible that changes will have to be made in the present methods of refining petroleum, the distillation being managed so as to take out from the crude oil the products easiest removed, and most valuable to the refiner, and leaving the residues for fuel. If the figures given above are correct, it would seem that the future of the petroleum industry in the United States is largely in the hands of the refiners. If they manage their refining in such a way as to turn a portion of the product into fuel, at a price at which this fuel can compete with coal, the reaction on the other products of the petroleum industry will unquestionably be great. This is especially true of the paraffine industry, and its allied products. A consumption of 10,000 barrels per day of reduced

oil would unquestionably raise the price of the paraffine products within the first month, and this new outlet for what has up to the present time been somewhat of a burden, cannot but be welcomed by the petroleum industry.

It only remains to say that the Pennsylvania Railroad will probably continue its experiments, and gradually bring the use of oil burning into practice, wherever it will result in economies. From the figures given above, however, it is quite evident that new fields must be discovered and the production largely increased before it will be possible to do more than perhaps run some few high priced passenger trains, or possibly shifting engines in towns, and in some localities stationary boilers, by means of oil.

Gogebic Ore Properties.

Within the past few weeks there has been a decided consolidation of mines in the Gogebic district into hands representing the Lake Shore & Western and the Wisconsin Central Railroads, and it is reported that the Chicago, Milwaukee & St. Paul is also acquiring mineral property on the range.

This leads the *Iron Age* to fear that these concentrations of mining properties into the hands of carrier companies will as in the case of the anthracite companies, lead to combinations restricting the output, unduly forcing up the price and crushing out the small miner. While this is possible, the circumstances are different in that the coal carrying roads were greatly built to develop definite coal basins, and all the anthracite coal is in one state.

The Gogebic deposit, of which so far about 30 lineal miles is developed, is paralleled by both the Wisconsin Central and the Lake Shore & Western, which ship at Ashland, while the St. Paul road, which will add another opposing factor, may ship either at Ashland, L'Anse au Loup or at Ontonagon, if the government piers at that place ever catch up with the bar. The Gogebic itself is in the two states of Michigan and Wisconsin, besides which there are the Marquette, Menominee, Vermillion and Canada deposits of Bessemer ores.

Thus it seems that to make an effective combination, which will control the output of Bessemer ores in the interest of increased prices, properties in three different states and a foreign country must be combined, a problem much more difficult than if all the mines were in one state, and that state one in which a special charter is requisite for building railroads.

The increase in shipments of ore from the various ports is as given by the Marquette *Mining Journal* up to June:

	1886.	1887.
Marquette	169,733	132,045
Escanaba	311,803	379,345
St. Ignace	13,813	18,685
Ashland	96,080	142,600
Two Harbors	36,039	39,924
	627,468	712,599

This is an increase of about 13½ per cent., nearly one-half of which is due to the Gogebic mines.

By ranges, the shipments were as follows: Marquette, 323,897; Menominee, 206,168; Gogebic, 142,600, and Vermillion, 39,924 gross tons.

The recent change of ownership in the Vermillion mine and the proved great extent of the range will probably largely increase its output in the future, no reason being apparent why it, as well as the other ranges, in spite of its hard ore, should not ship at least a million tons per annum.

The ores from all of these mines can be marketed at a small expense for transportation. The Gogebic ores, for instance, will require but 50 or 60 miles of railroad transportation to Ashland, and the distance from that port to the various consuming or receiving ports is as follows: To Milwaukee, Wis., 707 miles; Chicago, 770 miles; Cleveland, 798 miles; Ashland, Ohio, 840 miles; Erie, Pa., 879 miles; Buffalo, 948 miles; while by rail the distances are to Milwaukee and Chicago 890 and 475 miles. The Vermillion mines are slightly further from the points of consumption, while the Marquette and Menominee are nearer.

These large deposits of Bessemer ores, so near to the great lakes, which already float steamers of 3,000 tons gross register, that have carried coal 1,000 miles at from 35 to 70 cents per ton as a sea-on's rate, cannot fail to have a great influence, not only on our ability to furnish steel rails at a low price for further railroad extensions, but on the location of the country's rail mills. They also have an international interest in connection with the following remarks of J. S. Jeans, in his last report to the British Iron Trade Association. Speaking of the English sources of Bessemer ore supply:

"The three main sources whence we draw our ore imports are Spain, Algeria and Elba. The Italian government have apparently taken alarm at the rate at which the Elban deposits are being worked out, and have resolved that on the expiration of existing contracts such ores as remain shall be reserved for Italian works. The Algerian deposits are also largely depleted, and the chances are not in favor of our drawing large supplies from that source in the future. We are therefore left to reckon with Spain. The ores of Bilbao are, no doubt, still abundant, but the supply of the highest quality will become increasingly scarce, and for such ores as remain it would appear as if we must, in the immediate future, at any rate compete to a larger extent than hitherto, not only with other continental countries, but with the United States as well."

It is but little over a year ago that the President of the British Iron Trade Association suggested to his hearers that we were near the end of our available deposits of Bessemer ores, and would have henceforth to depend to an increasing extent on foreign ores. The developments on Lake Superior which were then well advanced, seemed to insure a long continuance of our position as the first steel-producing nation of the world.

Annual Report of the Harbor Commissioners of Montreal for 1886.

The tonnage of the port of Montreal is classified as inland and seagoing. The inland tonnage, which amounted to 1,044,380 in 1880, declined to 724,975 in 1885, and recovered to 809,819 tons in 1886. The seagoing tonnage, which was 628,271 tons in 1880 and declined to 531,929 in 1881, reached 809,699 tons last year, or in 1880 the inland tonnage amounted to about 62½ per cent. of the total, and last year the two were about equal. The increase in inland tonnage for the past year is probably due to a decrease in tolls on the canals.

The shipments have been—

Lumber, 126,893, M increase, 37,225 M.
Phosphate, 19,030 tons and 2,078 bags; a decrease.
Wheat, 5,964,238 bushels.
Corn, 3,966,707 bushels.
Peas, 2,253,719 bushels.
Oats, 1,954,125 bushels.
Barley and rye, 21,529 bushels.
Cattle, 65,824 head.
Sheep, 93,648 head.

The receipts of coal and coke were, from Great Britain, 31,786 tons; from the United States, 223,295, and from the Maritime Provinces 312,801; total, 567,882 tons.

The deepening of the St. Lawrence to a depth of 27½ ft. is expected to be completed by the close of this year. The present work is cutting a 2½ ft. slice 300 ft. wide from all shoals less than 27½ ft. in depth, much of this is shale rock in place, some is boulder clay and some clay. The average cost of dredging over 1½ million cubic yards under these conditions was 11½ cents per yard. Rock in place, i. e. shale, seems to have cost 33½ cents per yard; boulders 65 cents, and one clay cut of 886,710 cubic yards was taken out for \$25,723, or 2½ cents per yard, which Mr. John Kennedy, the engineer, says is "so low as to be almost with precedent."

The plant consists of seven elevator dredges with cast steel buckets, four spoon dredges and two stone-lifting barges, with tugs, scows, etc. The actual working time of the dredges was on an average 7½ hours per day.

At the meeting of the American Institute of Electrical Engineers in New York City, June 28, Mr. Geo. W. Blodgett, of the Boston & Albany road, read a paper on the electric lighting of passenger trains. The paper was principally a treatment of the points covered in Mr. Blodgett's article in the *Railroad Gazette* of April 15, with some additional particulars. He gave a description of the apparatus in use on the Southeastern Railway of England, where a train fitted with electric lights, supplied by dynamos in the cars, has been running for a considerable time. Mr. Blodgett reports that his experience with the trains running between Boston and New York continues satisfactory. He has the battery boxes under the cars arranged with stout brass springs on their sides, so that the simple act of placing them in position connects them together so that no wire connections have to be made or broken, either in putting them in or taking them out. Mr. Blodgett has designed an apparatus for combining the switches connecting the batteries with the lamps inside the cars, and with the terminals used to connect with the charging battery, by which the manipulation is rendered very simple and errors by careless or inexperienced attendants obviated. The cost of operating the lights is about \$2 per car per day, or one cent per hour per lamp. Of the electricity supplied to the storage batteries from the original source, from one-fourth to one-third is lost. In regard to his experience with primary batteries on trains, Mr. Blodgett says:

Most batteries furnish a continuous current for so short a time without renewal that their use is debarred on this account. Some others will not bear the shaking up produced by the motion of a train. An attempt was made two or three months ago to light a New York Central passenger car with batteries of some kind, which, I understand, failed. I have myself experimented for a considerable time, but thus far without finding a battery which will run on a closed circuit longer than two or three weeks, and at the same time can be carried on a train. When such a one can be found, which at the same time gives a current strong enough to light a series of lamps, it will have a great field of usefulness.

From the June report of the Department of Agriculture we learn that the acreage of winter wheat has decreased 2 per cent. from last year, while that of spring wheat has increased 6 per cent. The principal increase is in Dakota, Montana and Idaho. The net result is a total area sown to wheat this year of 37,000,000 acres. In 1884 it was 39,000,000, which was reduced to 34,000,000 in 1885, the result of winter killing. The average condition of winter wheat June 1, was 84.9, and of spring wheat was 87.3. These averages are neither low nor high compared with recent years—lower than the best, but considerably higher than the poorest. The highest average condition is found in the great spring wheat regions, and later reports indicate an improvement of condition generally, notwithstanding further injury from drought in certain regions.

There has been an increase of about 1 per cent. in the acreage of cotton. The condition of the crop is higher than any June since 1880, and has been exceeded only three times since 1870. There is, however, a great deficiency of rainfall reported for the whole cotton region, which has continued for the month since the report of the Department was made.

A telegram lately received in Berlin by the Chinese ambassador, from his government, announces that the short line of railroad from Taku to Tientsin was formally opened by the viceroy of that province on May 20. The *Engineer*, speaking on this text, concludes that the obstinate conserva-

tism of the Chinese government has been broken down by the march of events, and that it is impossible to foresee the development of railroads in China. This is attributed, however, to the pressure of the Russian advance upon their northern frontier rather than to any commercial or industrial reason. The acquisition of upper Burma by Great Britain led to the survey of the route by which that acquisition might be availed of for the construction of a railroad from Moumein, in British Burma, to the Chinese frontier of the very populous province of Yunnan, and it is argued that for British interests it is very important to develop this route connecting the Burmese system with the most important trade route of China. The Celestial government has decided to place the railroads in the hands of no syndicate and to give preference to no nationality; but construction is to be carried out upon the fullest principles of open competition; the rails are to be tendered for it in the open market, and no favor is to be shown to any nationality as to their purchases. It is thought that everything points to the rapid growth of railroads from the eastern coast of China towards the west, where they will, in course of time, meet those from Burma to the Chinese frontier.

One railroad "down South" deprives its trains of all time-table rights after they are twenty minutes late. That ought to be a good field for dispatchers and operators. If there were many roads of this kind there would be no excuse for the failure of a dispatchers' convention from lack of members.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows:

Chicago & Eastern Illinois, from Sidell towards Tuscola, Ill., 21 miles.

Chicago, Milwaukee & St. Paul.—Sioux City line, Manilla to Sioux City, since last reported 68 miles; from Roscoe, Dak., north to Hillsview, 26 miles; from Lake Preston, Dak., north 15 miles; a total of 109 miles.

Roanoke & Tar River, from Boykins, Va., south, 9 miles. Union Pacific, since June 1, Cheyenne & Northern, 33 miles; Omaha & Republican Valley, 0.7 miles; Greeley, Salt Lake & Pacific, 8.3 miles; Ogden & Syracuse, 6 miles; a total of 48 miles.

This is a total of 187 miles for the week, making 1,875 miles reported thus far for the current year. The new track reported to the corresponding date for 16 years has been:

	Miles.	Miles.	Miles.	Miles.	Miles.
1887.....	1,875	1883.....	2,109	1879.....	1,008
1886.....	1,375	1882.....	4,415	1878.....	691
1885.....	804	1881.....	2,221	1877.....	669
1884.....	1,313	1880.....	2,190	1876.....	740
				1875.....	2,754

This statement covers main track only, second or other additional tracks and sidings not being counted.

English Railroads—Their Administration, and the Status and Duties of Executive Officers.

IV.

THE GENERAL MANAGER.—Parliamentary legislation affecting railroads in Great Britain occupies a larger share of the time and resources of a general manager than most people out of England can suppose. While the public legislation itself is not of that universally paternal character which, according to ex-Consul Colonel Albert Shaw (vide May number of the *Contemporary Review*), is being constantly leveled against railroads in the legislatures of many Western states, still it needs watching, and the portion which is described under the heading of "private bills"—viz., bills introduced by other companies or bodies of private promoters—is always irksome and costly to combat.

In England there are, strictly speaking, no professional railroad parliamentary lobbyists, as are to be found in Washington or in the State Houses of the different state legislatures. General managers and solicitors (attorneys) have to do their own lobbying. In this they always, of course, have the co-operation of such of the directors of their respective boards as may happen to hold seats in either branch of the legislature.

If a railroad company projects the idea of constructing a new piece, of say half a dozen miles of line, endless formalities have to be gone through to get the requisite Parliamentary sanction. Railroad companies are not allowed to acquire, wholesale, vast tracts of territory as they do in the United States. In Great Britain they may not at any time hold above 50 acres of surplus land. They have to establish a public necessity for every yard they seek power to acquire compulsorily; and riparian landowners have the right to pre-empt any land not utilized within 10 years, at the same price at which they originally sold it to the railroad company.

From the day in November that the formal legal notice is published in the newspapers, of the company's intention to promote a bill to authorize perhaps the construction of the smallest bit of an extension, to the day in the following month of August when the bill, if it has previously passed both Houses, receives the royal assent to enable it to become a law, there is always something to be done by the general manager or solicitor. Whether it be in observing the endless complicated and expensive processes prescribed in the voluminous regulations known as the "standing orders" of each House of Parliament, or in the more substantial work of getting up a case and evidence in support of it, for the bill, or in counteracting and endeavoring to defeat the hostile action on bills of other companies, the general manager has always to be on the alert. It is in the arena of the Parliamentary committee rooms, with all its pompous trappings of nearly a state trial,

that the reputation, or that part of it which is generally valued the most, of a general manager is best made. His knowledge and experience of railroad workings at home and abroad; his mastering of questions of trade, shipping, finance, etc.—all valuable adjuncts—are not half so much esteemed by many people as the skill or finesse with which he can parry an ingenious or inconvenient question, or fence with counsel of eminence at the bar, or perhaps carry the war into his adversary's camp, and thereby insure the success of his own company's bill, or the loss of that of the opposing company. In proportion as he creates a good "impression" on the minds of the members of the committee who have to determine whether the "preamble" of the bill—that is, the general case for the measure—is made out, so is his ability assessed. Giving evidence on railroad bills before Parliament is always a severe ordeal, and tries the mettle of a man not bred to the law, because the committee are both judge and jury, and are often chosen by the Parliamentary committee of Selection for their special ability and aptitude to put a bill through a searching criticism, while all the counsel and most of the witnesses are invariably men of the highest technical skill in railroad matters, and in the practice and precedents affecting railroad legislation.

The cost of these contests before Parliamentary committees is often fabulous. In a recent bill for power to construct a ship canal from Liverpool to Manchester, which was passed after contests extending over three sessions, before three committees of each House of Parliament, the costs to all parties, both promoters and opposing railroad and dock companies, have been variously computed at from one and three-quarters to two millions of dollars, the promoters, who were all merchants and manufacturers, alone having expended in the aggregate about eight hundred and fifty thousand dollars. General managers and engineers of railroad and dock companies were the most numerous as well as the most effective witnesses against the bill, but it became law after three years' hard fighting, and the capital (fifty million dollars) is now in process of being raised by public subscription.

The responsibilities of a general manager to his board of directors is very considerable. Though the other officers engaged in the working of the traffic exercise a sort of quasi-independence, the general manager is the officer after all who attends the board meetings, and has to stand the test of discussion and inquiry into accidents, traffic results and traffic accommodation. The goods manager, the passenger superintendent, the permanent way engineer, the locomotive superintendent, the audit accountant, storekeepers and others are separately in the habit of almost daily conferring with the general manager on some one or more matters outside purely routine details. On some lines, there are what are formally known as "Executive Officers' Conferences," presided over by the general manager, held monthly, where questions of administrative working are discussed. The minutes are recorded and printed, and finally submitted to the board of directors for approval. But it is extremely questionable whether the system of individual responsibility and individual control and power of initiative on the part of a general manager of proved ability is not the more effective and remunerative in the long run. A man ought not to be held responsible for results where his powers of control or initiation are partly shared between conferences of officers on the one hand, or by committees of directors on the other.

As an instance of how a general manager's functions are exercised by steering between the Scylla and Charybdis of officers and directors' committees, let us suppose a question of competitive traffic between two cities both served by two or more railroads. It being a matter of high policy to put an end to the suicidal effects of a competition in freight (or goods) rates, the general managers of the companies in question arrange a meeting and settle terms of peace subject to the terms of the agreement being subsequently confirmed by their respective board of directors (or previously by the traffic committees of those boards). When all is adopted, the agreement is relegated to the goods manager (general freight agent) to see it carried out. The station agents and traffic canvassers are notified of the new rates and all matters of detail affecting classification of goods, claims, delays or rates for particular consignments of merchandise, etc., are promptly and directly settled by the goods manager from time to time. Occasions arise, however, where he must first confer with the audit department as to a question of account keeping, rates, rebates, etc.; or, possibly, a matter of train arrangements or haulage of goods wagons (freight cars), whereupon he consults the superintendent of the line, who has the appointment of all porters, shunters, signalmen, guards (conductors), etc., and who also has the fixing of the times and departures of all trains, whether passenger, goods or mineral. In all these matters the general manager rarely interferes with the goods manager, but when, for example, there is an infraction by one company of a traffic agreement or any of its terms to the alleged detriment of another company, then the general manager takes up the issue in true diplomatic fashion. It is in the discretion largely of the general manager whether he brings the matter before his directors at all, or when or how he does it; but as a matter of fact every general manager keeps *en rapport* with his chairman (president), and, at least, acquaints him regularly and closely with all matters of moment.

These controversies or paper wars between general managers are often stubbornly contested on the larger lines which handle much freight traffic, especially those hailing from the north; but on the southern passenger lines chairmen like Sir E. W. Watkin, M. P.; Mr. J. S. Forbes and Mr. S. Laing, M. P., themselves take up these inter-company controversies.

The Proportion of Locomotive Cylinders.

(Continued from page 437.)

ficient in the same respect to the extent of 6,500 lbs., or 9.2 and 9.5 per cent. respectively.

Among foreign passenger engines, the Belgian state locomotive has an excess of adhesive weight of over 20,000 lbs., or about 48.5 per cent.; the New South Wales Mogul an excess of nearly 16,000 lbs., or 25.3 per cent.; while the Great Northern Express engines, with 81½ inch. driving wheels, are deficient to the extent of 12,600 lbs., or over 24.8 per cent.

Among freight engines of American build, the variations are not so great. The Union Pacific Wooten Consolidation engine has an excess of 18,900 lbs., or 21.8 per cent., the Baltimore & Ohio Mogul an excess of 12,500 lbs., or 16.7 per cent.; while the Baldwin Decapod shows a deficiency of 18,300 lbs., or 12.5 per cent.

Of foreign freight locomotives, the six wheels coupled engine of the Great Eastern Railway has an excess of 16,200 lbs., or 24.6 per cent., while the Dübs consolidated engine, built for Brazil, has a deficiency of 14,900 lbs., or nearly 14.3 per cent.

Of switching engines, the Brooks six-wheeled switcher has a deficiency of 18,900 lbs., or 17.4 per cent.

Your Committee recommend, for general purposes, the use of the following formula:

$$\frac{d^2 \times S \times P \times 0.85 \times C}{D} = W$$

D = Diameter over tires when half worn.

d = Diameter of cylinder.

S = Stroke of piston.

P = Boiler pressure.

W = Weight on driving wheels.

C = Co-efficient for adhesion

1	for passenger engines.
4	
1	for freight engines.
4.25	
1	for switching engines.
4.5	

Should extreme economy in fuel and water consumption be considered imperative, and of greater importance than additional cost of superheaters and steam jacketed cylinders, and maintenance of same, a considerable increase of cylinder power would be admissible, so as to allow the average work to be performed with a correspondingly earlier cut-off and greater ratio of expansion.

The unsatisfactory results, however, obtained with the ordinary link motion from the wire-drawing of steam, when cut off much earlier than at 25 per cent. of the stroke, point to the desirability of using some other type of valve motion, when the extreme practice above referred to is contemplated.

Your Committee beg to thank members of the Association and others who responded to the circular for information used in the preparation of this report, which is respectfully submitted.

CHARLES BLACKWELL, }
F. L. WANKLYN, } Committee.
J. D. BARNETT, }

THE SCRAP HEAP.

Car Building in South America.

The Callao & Lima Railroad, Peru, has recently built a passenger car in its Callao shops. This is said to be the first car ever built in Peru.

An Australian Brake Failure.

A telegram from Sydney, N. S. W., June 23, says: By the wrecking of a train on the Hawkesbury Railway to-day seven persons were killed and 40 injured. The accident was caused by the failure of the brakes to work while the train was going down an incline.

State Ownership of Railroads.

Mr. Warring, in his book on state purchase of railroads, says that government activity in the acquisition of railroads has increased very much in recent years. In 1875 20 per cent. of the continental railroads belonged to governments, in 1882 36 per cent. was in the hands of governments, and to-day about 50 per cent. of the continental lines are under state management. In Germany the transfer of the entire railroad system to the government is nearly completed. Out of 16 continental governments 12 are proprietors of railroads.

South American Wheat.

Mail advices from the Argentine Republic report large operations in wheat. One export house made shipments representing a value little short of five million national dollars. Every year South America is becoming a more formidable competitor of the United States for the European wheat trade.

A Boston Episode.

The other evening, on one of the suburban trains going out of the city, there was a well-known Boston vocalist, who appropriated to his sole use and comfort two seats. While this luxurious wayfarer was enjoying so much room, there entered the car a man considerably under the influence of liquor. The inebriate could find no available seat save that which the first-mentioned passenger had appropriated, and, going up to the latter, the bibulous traveler said: "Move over, please (hic !); I want a seat." The other glanced up with a look of intense scorn, but did not deign further notice just then to his interlocutor. The intoxicated individual returned again to the charge with, "Can't you move over (hic !); and give a fellow a seat?" "No, I can't, and won't; you are drunk," was the curt response. "Well," stammered the other, "I know I'm drunk (hic !), but I'll get over that. You're a hog, and will never get over it."—*Boston Budget.*

The Land Grant Question.

The Secretary of the Interior has received answers from all the land grant railroads named in his rule dated May 23, 1887, requiring them to show cause or or before June 27, why the several orders of withdrawal from settlement of the lands within their indemnity limits should not be revoked and the lands embraced therein restored to settlement.

The St. Paul & Sioux City takes the position that as Congress, in the act of March 3, 1865, withdrew from market all the indemnity lands lying within twenty miles of the line of the road, it requires legislation by that body before its enactments dedicating the lands in question to this particular purpose can be repealed, and therefore any attempt on the part of an executive officer, by way of the revocation of the act of his predecessor, is in direct opposition to the expressed direction of Congress.

The St. Paul, Minneapolis & Manitoba claims that its grant, not being confined to the state of Minnesota, is entitled to land lying within ten miles of either side of its main and branch lines, irrespective of political boundaries; that suits are now pending in the United States District Court of Minnesota to test this claim; and that therefore such

lands cannot be made subject to adverse rights by homestead or pre-emption entries, or in any other way, until the rights of the company thereto have been first examined and adjusted.

The Atlantic & Pacific and the Oregon & California take the ground that, owing to the failure of the United States to survey the granted and indemnity land, in order to ascertain and settle the boundaries of the pending small land claims of settlers, their grants will fall short over a million acres in the case of the first named company, and nearly 300,000 acres in that of the latter, and it is submitted that it would be a manifest injustice if the existing orders of withdrawal should now be revoked.

A Little Southern Story.

There is a railroad in Louisiana. It is about forty miles in length. There is nothing strange about the fact that it is located in Louisiana, nor is there anything remarkable about its length. In fact it is in every essential point similar, at least, to other railroads in the country. What brings it into prominence here is an order recently issued by the management. Said order was addressed to passenger conductors, whom it in the most positive terms prohibits from going barefooted while on duty. It appears that it is fashionable with the inhabitants of the district traversed by this road to ignore boots, shoes and hosiery, and it is said that several of the conductors have resigned rather than put their feet in "hot boxes," as they term shoes, and those who have obeyed the order are regarded by the people as stuck up, and disposed to put on airs because they are working for a railroad. —*Exchange.*

A Happy Thought.

In a first-class carriage in Germany an Englishman was observed to be putting his head out of the window. The train was going fast and a sudden gust of wind blew his hat off. With a fearful oath he reached down to his hat box and hurled it after the hat. Then he sat down and smiled on his fellow passengers, but, of course, did not speak. The Germans roared with laughter, and one of them exclaimed: "You don't expect your hat box to bring your hat back to you, do you?"

"I do," said the Englishman. "No name on the hat, full name and hotel address on the hat box. They'll both be found together, and I shall get both; d'you see now?"

Then those Germans subsided and said they had always considered the English a great and practical nation.—*Morning News, Paris.*

Australian Roads.

The railroad from Hornsby to Hawkesbury River, Australia, 15 miles in length, and a portion of the line between Brisbane and Sydney was opened on April 7.

New Road in Guatemala.

It is said a railroad is to be built in Guatemala, beginning at San Tomas, on the Atlantic ocean, and running to the city of Guatemala, and thence on to the Pacific ocean, a distance of 275 miles. It is reported that the bonds of the company which is to build the road have been taken in Paris to the amount of \$6,000,000. The contractors are to receive \$50,000 per mile in government bonds, bearing interest in gold, and a concession of 28,000 acres of land.

Fire at Union Stock Yards.

A large portion of the Chicago Packing & Provision Co.'s works was burned on June 26. The main building, which was 300 by 475 ft., was a total loss. About 700 hogs were burned alive, and a large quantity of pork burned a long time after the wood-work was consumed. The loss is estimated at \$1,250,000; and the entire stock yards were saved from destruction only by the gentleness of the breeze, and the hardest sort of work on the part of the Fire Department.

Natural Gas.

A dispatch from Indianapolis, Ind., under date of June 26, says: "The feverish anxiety that has prevailed for three months over the result of the natural gas prospecting about the city has been quieted in a way very gratifying to those concerned. Several wells drilled in and immediately around the city have failed to yield in sufficient quantity for use, but 11 miles north of here drillers yesterday struck a strong supply. It is calculated that the well will yield 2,500,000 ft. of gas daily. Arrangements have been made to begin piping gas to the city. In ten days it will be supplied to consumers at ten cents per 1,000 ft., meter measurement. Several thousand acres of land have been leased by the gas companies, and eighty wells will be sunk as rapidly as possible."

A dispatch from Denver, Col., dated June 20, says: "Messrs. J. J. Thomas & Co., of this city, have been prospecting on some land they own, 18 miles north of Denver, for coal. At a depth of 200 feet they encountered coal and since that time have sunk 56 feet deeper. They were surprised the other day, on touching a match to the water which flows up through the beam to see it ignite. The chamber of commerce, who have been talking of making an experimental boring for gas, have concluded to aid the gentlemen in continuing the sinking of another well, and if gas in sufficient quantities is found it will be piped into the city and utilized."

F. J. Clemender, of Oil City; H. G. Hunter, of Pittsburgh, and Hugh Brawley, of St. Paul, have incorporated the Northwestern Natural Gas, Oil and Mining Co., capital \$500,000, and within a week a well will be begun in South St. Paul. Several prominent St. Paul men are interested in the scheme.

TECHNICAL.

Locomotive Building.

The Taunton Locomotive Manufacturing Co., Taunton, Mass., will soon enlarge its works by erecting a two-story structure for the use of their printing press business.

The Philadelphia & Reading has ordered the construction of thirty-five new locomotives at the Baldwin Works, at Philadelphia. Heretofore the engines were built in Reading, but the shops are overcrowded now with repair work. Ten of the new locomotives are for passenger service and the rest for coal and freight.

The Car Shops.

Arrangements have been made by the Milwaukee, Lake Shore & Western Railroad to extend the car shops at Kaukauna, Wis., at a cost of \$30,000. Machinery will be added to cost \$25,000, which will necessitate the employment of 120 more men.

The Bradley Car Works of Worcester, Mass., have just delivered to the Boston & Lowell 2 of a lot of 20 first class passenger coaches. These have all the latest improvements, including vestibule in each end, lavatories, etc.

Bridge Notes.

Proposals will be received by J. T. Dodge, Great Falls Townsite Co., Helena, Montana, until July 12, for building a combination bridge across the Missouri River, at Great Falls, to consist of 9 spans of 100 ft. each, centre to centre of end pins, with 20 ft. roadway, the trusses to sustain a moving load of 1,800 lbs. per lineal foot in addition to dead weight. Proposals for bridge entirely of iron or for Howe truss will be entertained. Separate proposals for masonry received at the same time. Masonry to be finished by Nov. 1, and the superstructure by Dec. 31.

The King Iron Bridge Co., of Cleveland, O., has received the contract to build an iron bridge across the Guadalupe River, at Cuero, Tex.

Proposals will be received until July 18, by John T. Cooper, Clerk of Commissioners of Railroads, Atlanta, Ga., for erecting a three-span iron bridge and trestle work. A force of men in the employ of the H. S. Hopkins Bridge Co., St. Louis, Mo., left last week for the Brazos River at a point near Granbury, Tex., to begin the work of putting the mammoth iron bridge of the Fort Worth & Rio Grande in position. This bridge was made by the Pencoyd Bridge Co., Philadelphia, at a cost of \$165,000. The Hopkins Co. is putting the bridge up for the Philadelphia company.

Manufacturing and Business.

Messrs. Copeland & Bacon, of New York, whose works for the manufacture of hoisting and winding engines and mining machinery are at Bridgeport, Conn., have decided to open an office and exhibition room at 309 Arch street, Philadelphia, on July 1, where will be shown a selected stock of their manufactures. They invite examination of their new double-cylinder horizontal hoisting engine, which is considered a model, both in design and workmanship. These engines are made with link motion, friction drum, or both combined, single or double drum, of any length and diameter, for any kind of hoisting. The Philadelphia representative is prepared to inspect locations and give technical advice and information.

The Electrical Accumulator Co., of 41 Broadway, have equipped the new Pullman vestibule train, running between New York and Chicago on the Pennsylvania limited, with their accumulator and storage batteries for electric lighting. It has also in successful operation a drawing-room car on the boat train of the Old Colony Road, running between Boston and Fall River. The company is now at work on orders from the New York, Lake Erie & Western, and other railroads.

The Union Indurated Fibre Co., which is a consolidation of the leading manufacturers of the ware, having its general office at 110 Chambers street, New York, has recently closed several large contracts with leading electric light companies for cells to be used in storage batteries. This company makes a specialty of railroad goods, such as tubs, flat and round bottom pails, water-coolers and spittoons.

Joseph Remsey, Chief Engineer of the Cincinnati, Hamilton & Dayton, has informed the Harden Star Fire Extinguisher Co., of Chicago, that during the past year the Harden grenade has been used by this company in 24 fires, with success in each case.

The Wm. A. Harris Engine Works, builders of the Harris-Corliss engine, Providence, R. I., report business at present better than it has been for six months past. Recent sales of this engine are as follows: Brown & Sharpe Manufacturing Co., Providence, R. I., 150 horse-power; Obermeyer & Liebmann, Brooklyn, N. Y., 175 horse-power; Smith & Anthony Stove Co., Wakefield, Mass., 175 horse-power; Sanford Mills, Sanford, Me., 1250 horse-power; Union Oil Co., New Orleans, La., 1100 horse-power; Standard Machine Co., Mystic, Conn., 175 horse-power; C. E. Graham, Nashville, N. C., 1125 horse-power; Star Mills, Middlebury, Mass., 1125 horse-power; Westmoreland Paper Co., West Newton, Pa., 1200 horse-power; Dyerly Co., Providence, R. I., 1 tandem compound; Saturday Globe, Utica, N. Y., 140 horse-power; Bridgeport Crucible Co., Bridgeport, Conn., 140 horse-power; Glenn Manufacturing Co., Haverhill, Mass., 240 horse-power; D. & H. Scoville, Hingham, Conn., 1100 horse-power; Loraine Manufacturing Co., Saylesville, R. I., 1250 horse-power; Taunton Copper Manufacturing Co., Taunton, Mass., 1100 horse-power; New York Feed Co., New York, 150 horse-power; Otis Co., Ware, Mass., 1250 horse-power; B. F. Goodrich Co., Akron, O., 1125 horse-power; Standard Yarn Co., Oswego, N. Y., 1125 horse-power. Mr. Harris has recently purchased a lot in the rear of his works, and will proceed at once to erect a large foundry thereon.

Wm. H. Warren, of Worcester, Mass., is soon to be located in a new shop, at 35-37 Hermon street, with 50 per cent. more room and an addition of several new tools. He has just received an order from the U. S. A. Ordnance Department for one 24-in. stroke traverse head shaper with several special features.

The United States Fire Clay Co., of Cleveland, O., has recently received the contract for furnishing sewer pipe in the City of New York. The total number of miles to be furnished is about 15. The company, in connection with the Ohio Sewer Pipe Co., is also erecting works near New Lisbon, Ohio, which will give it a capacity of 6,000 cars per annum.

The Lappin Brake Shoe Co. is full of business at the Bloomfield, N. J. works. One order for the 3,100 of the shoes was completed a week or two ago for the Manhattan Elevated Railroad Co., New York.

Iron and Steel.

The contract for the iron superstructure for the three long spans of the Herr's Island bridge has been awarded to D. W. C. Carroll & Co., Limited, of Philadelphia, Pa., for the sum of \$350,000.

The Centralia Iron & Nail Co., at Centralia, Ill., is erecting a new steel plant.

The foundries of Fuller & Warren, Bussey & McLeod, Burdett, Smith & Co. and the Cooperative Works, of Troy, N. Y., resumed operation this week after a shut-down of six weeks. About 3,500 men were given work.

The Oxford Iron Co.'s works, of Oxford, N. J., which have for the most part of the last two months been lying idle, were started up in full blast last week. The mines in the neighborhood of Oxford are working full-handed.

The Cambria Iron Co., Johnstown, Pa., has secured 8,000 acres of ferro-manganese land in Independence County, Ark. The Amoskeag Manufacturing Co., Nashua, N. H., will build a new foundry.

A large pinion wheel in the puddling department of the National Rolling Mill, McKeesport, Pa., broke about a week ago, throwing 200 men idle for four weeks. The management have decided to make the annual repairs before resuming operations.

The Rail Market.

Steel Rails.—The 10,000-ton lot of foreign rails reported last week was sold by the Moss Bay Steel Co. to the Louisville & Nashville Railroad at \$40.50, New Orleans. Only two sales of consequence are reported this week, a 4,000-ton lot, West, and a 2,000-ton lot, Virginia port. Quotations at Eastern mill, \$38@39.

Old Rails.—The market has been dull, the only sale being a lot of 500 tons of double heads. Holders are asking \$22@22.50 for tees and \$23@23.50 for doubles.

Scrap.—Market very dull. Yard scrap, \$21@22. **Rail Fastenings.**—Spikes, 2.40@2.50c. net; angle fish-bars, 2.10@2.25c.; steel angle bars, \$2.20@2.30c.; bolts and nuts, 3@3.20c.; and bolts and hexagon nuts, 3.20@3.30c.

Oil by Canal.

Some of the most productive oil fields of Ohio are found along the line of the Miami & Erie Canal, particularly at Lima and St. Marys. Some parties have taken advantage of this fact and are having four iron tank canal boats built at Buffalo of 80 tons or 600 barrels capacity each. The

boats are to be built of double riveted boiler iron and amply protected from danger by fire or lightning. It is proposed to deliver the oil into tanks on the line of the canal and rivers at such points as present a demand.

This order of boats is experimental, and it is hoped that the experiment will be a success, as it will save cooerage and some of the expenses of tankage. It will be a slower mode of delivery than by oil tank cars, but cheaper. The great drawback lies in the fact that for about five months of the year it will be inoperative.

Western Society of Engineers.

At the regular meeting, June 7, Mr. Parkhurst, of the Committee on Construction, reported the recommendation that the paper on "Hydraulic Motion," by Mr. McElroy, be published in full, and discussed after publication. A paper was read by Mr. C. H. Hudson on the "Change of Gauge of Southern Railroads in 1886," and discussed by the Society.

At the next meeting papers are expected from Mr. Zellwege and Mr. Lundie.

Stephenson's Locomotives.

Messrs. Robert Stephenson & Co. have issued a lithographic sheet of line drawings of locomotives constructed by them, commencing with "Locomotion" of 1825, and following with a complete series up to the present time.

Rails for China.

It is said that tenders are being invited from English rail makers for 12,000 tons of steel rails for China.

Shifting a Bridge.

On June 26, thirty-two men moved a distance of 50 ft. the iron bridge, weighing 1,600 tons, that spans the Pennypack, at Holmesburg Junction, Pa., on the New York division of the Pennsylvania Road. The work was done in 11½ minutes. About 2,000 people saw the achievement. A four-arch stone bridge is to be built in place of the one moved.

A New Ore Shipping Port in Minnesota.

It is said that by the end of next season the Vermillion range in Minnesota will probably possess two shipping ports. It is pretty well settled that the Duluth & Iron Range road will continue to ship all the ore that it handles from Two Harbors, on Lake Superior. Grand Marais, however, which at present consists of a very few scattered buildings, is destined to be an ore shipping port of importance within a comparatively short period. A fine harbor can be made there, and it is considerably nearer the mines, especially those east of Tower, than Two Harbors, and the new ore beds which are quite sure to be found still further east will render the construction of ore docks at Grand Marais absolutely necessary. The Canadian Pacific is the road which is expected to build docks at Grand Marais.

Fibrous Steel.

Steel is scoring another point in its contest with iron. Ironmasters who, as sheet, and plate, and angle makers, have been suffering acutely from the distinct advance which steel has made as a metal possessing bending and shaping qualities, have hitherto assumed that, however malleable the opposing metal may become, it is unlikely to attain to a fibrous quality. The grand fibre which distinguishes the best qualities of Yorkshire and Staffordshire iron had been held to be a fortress impregnable to all the assaults of the most accomplished of the steelmasters. The security of the Staffordshire firms has just been rudely disturbed by the exhibition in several of the localities in the Black Country of a section of a ¾-in. round bar of steel characterized by undisputed fibre. It is explained that it has been made by the granulating and balling up of Siemens-Martin steel under a process which has been patented by Messrs. Dorman, Long & Co. and Mr. R. Howson, of Middlesbrough-on-Tees. If, by and by, this "fibrous steel" should be shown by experience to be equal to the service of cable and rivet making, the best iron firms will be run very hard, since it will be impossible for them to compete with the steelmasters in the matter of price. The makers hold that the new metal is well adapted also for armor plates—in the manufacture of which the pile has to return to the fire so often—since the silicious coating of each fibre protects it, it is claimed, from the action of the fire, where pure iron would perish. For the same reason, it might be used, it is inferred, for the bilges of ships, as to which recent experience has shown that homogeneous steel is subjected to rapid oxidation.

An Electric Headlight.

The Master Mechanic, in connection with a description of an electric headlight used on Lake Shore & Michigan Southern engine No. 411, and a view, reproduced from a photograph taken at night, showing its effect says: It will be seen that 23 telegraph poles are visible, but under more favorable conditions 45 poles have been counted, which is equal to a distance of about 1½ miles. A newspaper has been read by the light four miles away, and the time of night has been seen on a watch face nine miles distant. The reflection of the light in the clouds has been noticed 12 miles away. The headlight is the invention of Mr. Howard L. Pyle, and has been in operation between Cleveland and Erie nearly a year, giving entire satisfaction. In snow storms it is noticed that the snow and sleet melt the instant they touch the glass, which is kept warm by the light. The locomotive runners say that targets, switch lights and semaphore can be distinctly seen, and the colors are as readily discernible as by day light. A man can be seen three-fourths of a mile away. The illumination on the track for a mile ahead is so noticeable that it gives good warning to wayfarers of the approach of the train thus in a measure obviating the necessity of using the bell or whistle. Mr. Pyle is said to have overcome the various obstacles heretofore encountered in experiments of this kind. He uses for motive power a Bailey rotary engine.

Boston Society of Civil Engineers.

At the regular monthly meeting of this society it was voted to omit the regular meetings for July and August. The death of Mr. George A. Parker, an honorary member of the Society, was announced. A portrait of Mr. William Parker was presented to the Society and Professor Vose gave some sketch of his life and works. Mr. E. S. Philbrick read a paper on the landslide of May 1, 1884, on the Boston & Maine Railroad at Dover, N. H. Professor Vose described some peculiar designs of railroad bridges which had come to his notice. This was followed by an informal talk upon bridges.

Engineers' Club of Minnesota.

At the regular May meeting of this Club it was voted to sanction the proposition of the managers of the Association of Engineering Societies to call a meeting of delegates from the societies to promote the project of a confederation of engineering societies. At the regular June meeting, Mr. F. W. Cattleen gave an account of the polytechnic schools of Europe.

At a special meeting, held June 24, the club appointed the president, Mr. George W. Sublette, a delegate to attend the annual convention of the American Society of Civil Engineers at the Kaaterskill Hotel. Messrs. Cappellen, Pike, Houston, Redfield and Pardee were appointed a standing committee on tests of materials, to confer with the faculty of the State University with reference to a series of tests. A

brief memoir was read of Franklin Cook, late member of the club.

Transfer of English Works to this Country.

According to the Pittsburgh Dispatch the Moss Bay Hematite Iron & Steel Company (Limited), of Workington, England, have decided to remove their works to this country, and erect them in Washington Territory. This company was formed in 1880 or 1881 from a private concern and paid dividends up to 1884, one of 12½ per cent. Since that the depression in England has prevented any further payments, though their profits for 1885 were £9,282. Their capital is £350,000 and £60,000 debenture bonds.

While the Moss Bay Company come to this country on account of the depression in England, Johnson & Son, potters of Hunley, Staffordshire, who employ about 250 workmen, have a member of their firm in Pittsburgh, according to the American Manufacturer, looking at the advantages which may be offered by natural gas, who thinks that on account of the cheapness of natural gas the firm could do a great deal better business there than in Staffordshire.

Mr. Johnson believes that the establishment of his firm here would give a great impetus to the industry in America, and is surprised that the practical shrewd business sense of the Americans has not realized that before, and aided the introduction and establishment of English firms here.

Puddled Aluminium Iron.

Last week we had occasion to refer to some successful experiments in the manufacture of cast steel, free from blow holes. The results were due to the admixture to the steel of 0.1 per cent. of aluminium. During the week just closed, experiments were made with puddled iron in charges of 500 lbs. The results were by no means conclusive, but enough was shown to illustrate the advantages of combining aluminium with iron. Strangely enough, the charges containing the low percentages of alloy turned out the strongest material. So, for instance, the addition of 0.1 per cent. of aluminium raised the tensile strength from 52,000 lbs. to 60,000 lbs., an increase of 16 per cent., while the elongation was variously increased up to 21 per cent. One of the tests conformed to the method of testing marine steel, the elongation of the one inch test spot being 0.1875 per cent., or ⅜ of an inch. What may be done with puddled iron is shown by experiments conducted by Mr. Graham W. Thompson, a leading iron manufacturer of Glasgow. The tensile strength of ordinary puddled iron, 22 long tons with 12 per cent. elongation, was by the addition of 0.25 per cent. of aluminium increased to 31 long tons, with 23 per cent. elongation. When mixed in equal parts with ordinary stock, this treated material still showed a tensile strength of 28 English tons, with 8.28 per cent. elongation, and a third mixture of the already reduced stock with common stock resulted in a tensile strength of 25 tons, with 7 per cent. elongation. The experiments with puddled iron will be pursued in other ways until some fixed rule of procedure may be established.—Cleveland Iron Trade Review.

The Effect of Hot Weather on Steel Rails.

So intense was the heat on Monday last that some of the rails on the London & Northwestern Railway, between Huyton and Prescott, became twisted, and for a time put an entire stop to the whole of the traffic between Liverpool and the stations going north. The first train that was stopped was the 2.15 p. m. from Lime street for Carlisle and Scotland, and before it could proceed on its journey it had to be got on to the up line, and be conveyed on it to the next station, involving a delay of about twenty minutes. Succeeding trains were similarly blocked. The matter was put right by cutting off between three and four inches of each rail, one length of which only was twisted, which occupied over an hour, with the result that the trains for the north were delayed at Huyton Junction till twenty minutes to four o'clock. The rails affected run along an exposed portion of the track known as the Bank. They are tight-jointed for some distance, and this allows for no expansion. It is believed that the rails would have remained in their position notwithstanding the great expansion to which they were subjected but for the fact that a number of men were working on the line, as usual, and they disturbed the lines, which, once started, did not take long to assume a remarkably unusual form.—The Iron-monger.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Western Society of Engineers holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The American Society of Civil Engineers holds its annual convention at the Hotel Kaaterskill, Hudson River, N. Y., the first week of July.

The American Institute of Mining Engineers, forty-eighth meeting, Salt Lake City, Utah, July 6; forty-ninth meeting, Duluth, Minn., July 26.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cheshire, semi-annual, 3 per cent.

Delaware, Lackawanna & Western, 1½ per cent., payable July 20.

Chicago, St. Paul, Minneapolis & Omaha, 3 per cent., semi-annual on preferred stock, payable July 20.

Flint & Pere Marquette, 3 per cent., on preferred stock, payable July 15.

Manhattan, 1½ per cent., payable July 1.

St. Paul & Duluth, 3½ per cent. on preferred stock, 3 per cent. on common stock, semi-annual.

St. Paul, Minneapolis & Manitoba, 1½ per cent., quarterly, payable August 1.

PERSONAL.

—James Smith, General Traffic Manager of the Wabash Western, has resigned the position.

—Sir George M. Pullman is in London for the purpose of extending his palace car system on the English roads, and to have the stock of the company listed on the London Exchange.

—Mr. Charles Macdonald, of the Union Bridge Co., has started for Sidney, New South Wales, on business connected with the Hawksbury bridge. He will probably be gone about three months.

—M. M. Green, builder and former president of the Columbus, Hocking Valley & Toledo, died in Columbus, O., on June 26, aged 57. Mr. Green began his railroad career over 30 years ago on the Vermont Central road.

—President Chauncey M. Depew, of the New York Central, has been made a doctor of laws by Yale College. The New York Tribune, taking advantage of a good natured man who will not be offended at pleasantry, prints Dr. Depew's title in full as "A. M., LL.D., N. Y. C. H. R. R."

—William F. Smith, General Eastern Passenger Agent of the Chicago & Grand Trunk, was found dead in his office in

New York on June 27. An autopsy showed that death was caused by heart disease. Mr. Smith was born in Albany, N. Y., in 1853, and went into the railroad business in 1872 as New York Ticket Agent of the Central Vermont road.

—A. A. Talmage, Vice-President and General Manager of the Wabash Railway, died suddenly on June 29, while on his way from St. Louis to Toledo.

Archibald Alexander Talmage was born in Warren County, N. J., April 25, 1834, and was of Scotch descent. At 15 years of age he was engaged as an assistant at a country store in Goshen, N. Y., and remained there for two years. When 18 years of age he was appointed clerk in the freight department of the New York & Erie Railway, and remained there for a year. Then he went to New York and worked in a wholesale hardware establishment on Dey street. In 1854 he went to Chicago, where he obtained a situation with the Lake Shore & Michigan Southern as clerk in the freight department. He was soon given charge of all the freight exchanged at the lake terminus of the road at Monroe, then was returned to Toledo, where he remained until August, 1858. While there he acted as trainmaster, directing the movements of all trains on the division of which Toledo was the terminus, and having charge of all employees at that point. He left Toledo and went to St. Louis as passenger train conductor on the Terre Haute & Alton Railroad. In April, 1864, he was appointed Assistant Superintendent of the Ohio & Mississippi. In 1864 he resigned to accept a position on military roads controlled by the Government. He remained in charge until the Government turned them over to the civil authorities after the war.

In 1868 he was appointed Manager of the Indianapolis & St. Louis, and in 1871 General Superintendent of the Atlantic & Pacific. He was in charge of that system for 12 years. On March 1, 1874, he was chosen Fourth Vice-President and General Transportation Manager of the combined Wabash and Missouri Pacific roads. The Wabash shortly afterward was severed from the Missouri Pacific and placed under the control of the United States Court, with Messrs. Humphrey and Tutt as Receivers, and Mr. Talmage was appointed General Manager. He entered upon his new duties on July 10, 1884.

His administration of the affairs of the bankrupt road was wonderfully successful. He built up a large business on a profitable basis. When the Eastern and Western branches of the road were separated from one another, Mr. Talmage was made Vice-President and General Manager of the Wabash Western Railway Company, with headquarters in St. Louis.

ELECTIONS AND APPOINTMENTS.

Cairo, Vincennes & Chicago.—E. W. McGee has been appointed Northern Passenger Agent, office at Danville, Ill.

Chattanooga Southern.—The incorporators of this Georgia company are: W. Crutchfield, Robert Dougherty, John T. Wood, C. W. Everett, J. F. Smith, G. W. Hill, Hiram Smith and J. C. Henderson.

Chicago, East & West.—The incorporators of this company are: Joseph Stockton, Rudolph H. Garrigue, Lewis B. Jackson, Thomas Morfitt, John C. Parkes, Paul W. McWhorter, Morris Sellers, Jacob P. Castleberry and George Millard, all of Chicago.

Chicago, Milwaukee & St. Paul.—George Gibbs has been appointed Mechanical Engineer.

Cincinnati, Jackson & Mackinaw.—F. B. Drake has been appointed General Manager; headquarters at Van Wert, O.

Cincinnati United Terminal.—The following directors were elected last week: Robert Garrett, of Baltimore; B. B. Morehead, F. H. Short, John Carlisle, Judge Judon Harmon, all of Cincinnati. The directory organized, electing John Carlisle President and F. H. Short Secretary and Treasurer.

Duluth & Iron Range.—Edward Byrne has been appointed Car Accountant, office at Duluth, Minn.

Garfield, Pawnee & Colorado.—The directors of this new Kansas company are: C. W. Nimocks, Great Bend; A. J. Hoisington, Garden City; R. M. Spivy, Newton, and P. D. Terry, of Terryton, Kan.

Great Bend, Water Valley & Western.—The first directors of this Kansas company are: C. W. McDonald, Concordia; Ira Lloyd, Ellsworth; A. M. Leesley, Lyons; M. P. Simpson, McPherson; D. R. Heizer, E. L. Chapman, A. C. Schermerhorn and G. W. Nimocks, Great Bend, Kan., and S. B. Dupree.

Iberville, Dunham & Clarenceville.—This Canadian company organized last week by electing the following directors and officers: E. J. Chamberlin, F. S. Stranahan and George A. Mountain, of Ottawa; E. C. Smith and Geo. A. Ayer, of St. Albans, Vt.; George Nelson Clark, of Clarenceville, and Stephen H. Jones, of Sabrevois. E. J. Chamberlin was elected President; George A. Ayer, Vice-President; F. S. Stranahan, Treasurer, and L. A. Trudeau, Secretary.

Indiana Railway Co.—The directors of this company, which is the new corporation of the Indiana, Bloomington & Western in the state of Indiana, are Charles B. Lockwood, C. F. Fairbanks, Harry Diehl, C. E. Henderson and Ford Woods.

Los Angeles County.—The directors of this new California company are: M. L. Wicks, R. C. Shaw, O. C. Rounds, I. S. Miller and E. C. Burlingame.

Louisville, Cincinnati & Virginia.—The directors of this Kentucky company are: Douglass Green, J. L. Robertson and F. K. Hain of New York; ex-Senator J. S. Williams, A. W. Hamilton and T. G. Stuart, of Kentucky, and W. D. Hill and E. F. Hunt, of Birmingham, Alabama.

Marshall, Paris & Northwestern.—The following directors were elected at the meeting in Marshall, Tex., this week: John Martin, Frank Fitzhugh, L. P. Harrison, S. J. Wright, E. G. Zeale, E. J. Fry, W. W. Heartsill. The following officers were elected: John Martin, President; S. J. Wright, W. W. Heartsill, Vice-Presidents; E. J. Fry, Secretary and Treasurer.

Minnesota Belt Line Railway & Transfer Co.—The incorporators of this Minnesota company are: W. D. Washburn, A. J. Bletten, R. B. Langdon, H. E. Fletcher, John Crosby, W. S. King, George A. Brackett, J. S. Phillipsbury and W. H. Eustis.

New Mexico Central.—The officers of this New Mexico company are: Judge Henry L. Waldo, of Santa Fe, President; W. H. Rossington, of Topeka, Vice-President; E. W. Wilder, of Topeka, Secretary and Treasurer; W. W. Griffin, of Santa Fe, Assistant Secretary; G. L. Goodwin, of Boston, Assistant Treasurer; A. A. Robinson, of Topeka, Chief Engineer; J. P. Whitehead, of Boston, Comptroller and General Auditor.

New York Central & Hudson River.—Walter C. Randolph has been appointed Traveling Passenger Agent for this and the West Shore roads, with headquarters at Buffalo, N. Y.

Omaha & Yankton.—The incorporators of this new Nebraska company are: H. W. Shephard, of Boston; John F. Dillon, Samuel D. Mercer, J. F. Fitzgerald and Walter Sheldon.

Pittsburgh & Western.—The company reorganized last week and elected the following officers: President, James Callery, Allegheny City; Vice-President, A. J. Thomas, New York; Treasurer, J. P. Curtis, New York; Secretary, H. D. Campbell, Pittsburgh; directors, James Callery, J. W. Chalfant, William Semple, Allegheny; H. W. Oliver, Jr., Pittsburgh; A. J. Thomas, C. H. Coster, A. H. Brock, New York.

Pueblo, Bessemer & Highland Park Circle.—The incorporators of this Colorado company are: A. Royal, H. N. Banks, J. B. Orman, T. Saunders, W. J. Kerr, A. G. Grabam, L. O. Shull, E. H. Martin, W. T. McKinney, J. K. Shirman, F. M. Tague and Frederick O. L. Buck.

Red Cloud, Kirwin & Southwestern.—The directors of this new Kansas company are: D. Dodge, H. Moulton, W. T. Belford, C. C. Stone and M. H. Johnson, of Kirwin; C. C. Woods, Stockton; J. T. McDowell, Smith Centre; W. H. Burke, Osborne City, and S. O. Spaulding, of Phillipsburg, Kan.

St. Louis, Arkansas & Texas.—D. Miller has been appointed General Freight and Passenger Agent vice A. S. Dodge, resigned. Office at St. Louis, Mo.

St. Paul Belt.—The incorporators of this Minnesota company are: Edmund Rice, Jr., William G. Gostan, William Dawson, Jr., John H. Morrison and Edwin A. Jaggard, all of St. Paul.

Topeka, Stockton & Northwestern.—The directors of this new Kansas company are: Thos. A. Osborne, C. C. Gleed, of Topeka; Freeling Tufts, of Lincoln; C. A. Smith, C. C. Woods, W. W. Chambers, A. B. Montgomery and H. Dewey, of Stockton; Albert Graves, G. V. Peterson, George W. Steer, of Norton; N. R. Waterman, of Lincoln, Kan.

Trumbull & Mahoning.—The incorporators of this Ohio company are: Asa W. Jones, Henry M. Garlick, David E. Davis, Thomas E. Davey and James M. Reno.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—The company has put a corps of surveyors in the field between Litchfield, Ill., and St. Louis, Mo.

The headquarters of the First Vice-President has been removed from Topeka, Kan., to Chicago, Ill.

Baltimore & Ohio.—The Baltimore Sun reports that Robert Garrett has exercised the option and taken and paid for the stock in this company held by the Johns Hopkins University trustees. There were about 15,000 shares of the stock which Mr. Garrett took at 175, the price fixed in the option, and the total amount involved was between \$2,500,000 and \$3,000,000.

Bangor & Piscataquis.—The proposal for a lease of the Penobscot Central to this company for 20 years at an annual rental of \$25,000 is not satisfactory to the Bangor & Piscataquis. The term of the lease is the objectionable feature, the latter corporation desiring one in perpetuity. The matter has been placed in the hands of a committee with instructions to confer with a committee representing the Penobscot Central.

Buffalo, Rochester & Pittsburgh.—An order has been made by the Court continuing the restraining order in the case of James B. Hayes against this company. The original order was one restraining the officers and stockholders from issuing \$3,000,000 of certificate of indebtedness pending a motion for a preliminary injunction covering that and other proposed actions of the Board.

Butte & Ruby Valley.—Incorporated in Montana in the interest of the Union Pacific. The company proposes to build a line from Butte to the National Park, with three branches in Madison County.

Central of Georgia.—The engineers are at work on the road from Blakely to Columbus, Ga.; from Clayton to Ozark; and from Troy, Ala., to Elba. Tracklaying will begin this week from Carrollton to Decatur, Ala. This line will connect with the Illinois Central. Ten heavy consolidated engines have been ordered for the Goodwater extension and for the transportation of mineral and coal of the Birmingham section.

Chattanooga Southern.—Incorporated in Georgia to build a road from Bowling Springs, on the Tennessee line, to Alpine, on the Alabama State line. The road will extend southeast from Chattanooga, Tenn., through Georgia into Alabama. Capital stock, \$1,000,000.

Chicago & Eastern Illinois.—Tracklaying is completed on the extension between Sidell and Tuscola, Ill., to within 7 miles of the latter place. It is expected that trains will be running by July 15.

Chicago East and West.—The company has obtained a charter in Illinois, and will build a road from a point in Cook County, on the east boundary of the state, through Hyde Park and Lake to Chicago, thence southwest to the west boundary of the state, in Mercer County, with a branch line from the town of Lake to Blue Island. Office, Chicago. Capital stock, \$10,000,000.

Chicago, Milwaukee & St. Paul.—The entire plant of this company's rolling mills in Watertown, Wis., was burned last week, throwing 200 men out of employment. Loss, \$150,000.

Chicago, St. Paul & Kansas City.—The Oelwein extension of this road between Waterloo and Oelwein, Ia., 25 miles, was opened for business last week.

The company has decided to locate shops at St. Joseph, Mo.

Consolidated Elevated of Philadelphia.—The bill for granting the right to this company to build elevated railroads in Philadelphia was killed in Select Council this week.

Cumberland & Ohio.—A United States marshal has been trying to collect taxes for the payment of county railroad bonds of this company in Taylor County, Ky., in accordance with judgments recently issued. He reports that the people are terribly determined not to pay these bonds, and are talking about bloodshed in connection with the enforcement of the mandate of the Court. In this particular case the amount of taxes involved is \$18,000, though the total amount due the bondholders from other counties is \$250,000. The road was never built.

Dakota Union.—Incorporated in Dakota to build a line from Lincoln County to the city of Bismarck, 400 miles.

Erie & State Line.—Application has been made in Pennsylvania for a charter for this company, the line of which will run from the New York to the Ohio State line, 44 miles. Capital stock, \$3,000,000.

Fitchburg.—The consolidation papers of this and the Troy & Boston companies were filed in the Secretary of State's office in Albany, N. Y., on June 25.

Fort Worth & Denver City.—The stockholders have granted the directors the authority to increase the capital stock of the company to \$20,000,000, and also the authority to operate the Denver, Texas & Gulf road when it is completed.

Garfield, Pawnee & Colorado.—Chartered in Kansas. The proposed road will extend from the county seat of Garfield County to Denver, through Garfield, Finney, Wichita, Greeley, Hamilton and Kearney counties. Capital stock, \$2,000,000.

Georgia Southern & Florida.—T. J. James & Co., of Atlanta, Ga., have been awarded the contract for grading this road, and Pittman, Baker & Co., of Thomasville, have the contract for ties and trestles.

Great Bend, Water Valley & Western.—The company has obtained a charter in Kansas. The purpose is to build a road from Concordia, in Cloud County, by way of Great Bend to El Paso, Tex., and from a point at or near McPherson, in McPherson County, by way of Ellinwood to Water Valley and Colorado Springs, Col. Estimated length of line from Concordia to El Paso, Tex., 1,000 miles; estimated length of McPherson and Colorado Springs line, 500 miles. Office of company, Great Bend, Kan. Capital stock is placed at \$5,000,000.

Houston Central, Arkansas & Northern.—Major James Converse, of Houston, Tex., Chief Engineer, says that the survey of this road will be begun this week and finished in 90 days. It will begin at Pine Bluff, thence to Monticello, Hamburg, Bastrop, Monroe and Columbia, and from there to Alexandria. The distance will be about 215 miles.

Iberville, Dunham & Clarenceville.—This company, whose charter was obtained at the last session of the Parliament of Quebec, has formally organized. Ten per cent of the capital stock has been subscribed, and the preliminary survey ordered.

Indiana Railway Co.—The Indiana, Bloomington & Western is preparing for the reorganization. It is necessary to have a new organization in each state through which the lines pass, the different companies to be eventually consolidated. The company has filed articles of incorporation in Indiana under the above name. Capital stock, \$7,600,000.

International of Canada.—Ground was broken last week at West Cove, foot of Moosehead Lake, in Maine, for the extension of this road. The new section extends from the Canada line to Mattawamkeag, Me., about 200 miles, and there connection will be made for St. John, N. B., 150 miles, over the Maine Central and New Brunswick roads. The contracts have been let in sections. The new track begins at Megantic Lake on the line between Western Maine and Canada and runs nearly due east along the valley of the Moose River to the shore of Moosehead Lake, 100 miles; then south along the shore to Greenville, 20 miles. From there it extends nearly due east to Mattawamkeag, about 60 miles further, making a slight bend south to avoid the central tier of lakes. At Mattawamkeag it strikes the northern division of the Maine Central, which is about 150 miles from St. John. The entire route to be built is through a wilderness. The little village of Greenville is the only settlement of any moment between Megantic and Mattawamkeag. With the exception of Brownville, where it crosses the Katahdin road, this is the only township, the remainder being plantations known only by numbers. Two years is the time estimated for the completion of the entire line, though it is thought that the section to Greenville will be in operation next summer.

Kansas Central.—The application for a receiver for this road, recently reported, has been withdrawn. It is said that an offer of \$1,250,000 for the property from the Chicago, Burlington & Quincy was refused by the Union Pacific. The latter company has agreed to pay the bonded interest, the neglect of doing which had occasioned the trouble from the local bondholders.

Los Angeles County.—Articles of incorporation filed in California. The object is to build a standard gauge road from a point in the City of Los Angeles to a point on the Bay of Santa Monica. Capital stock, \$300,000.

Louisville, Cincinnati & Virginia.—This company has organized in Kentucky. The Legislature granted the charter three years ago. The proposed road starts from Winchester, Ky., where it connects with the Kentucky Central and the Elizabeth, Lexington & Big Sandy roads, proceeds to the three forks of the Kentucky River and thence passes through the coal fields of southeastern Kentucky to a point on the Virginia line, where it connects with the Norfolk & Western. The engineers will begin locating the line at once.

Louisville Southern.—The company has made a mortgage for \$2,500,000 to the Louisville Safety Vault Trust Co. The mortgage is upon all the property, charter and all other privileges, and is to secure bonds upon which money is to be raised to complete the road, which is building from Louisville, Ky., to a connection with the Cincinnati, New Orleans & Texas Pacific, 84 miles.

Manhattan.—The New York Rapid Transit Commission has rescinded its action laying out a route of additional elevated roads through Battery Park.

McKenzie, Ohio & Mississippi.—Charter filed in Tennessee. The road is projected to run from McKenzie, Carroll County, to the Tennessee River in Decatur County.

Milwaukee, Lake Shore & Western.—The new ore dock of this company at Ashland, Wis., is completed and ready for use. It has 234 pockets, with storage capacity for 27,000 tons of ore.

Minnesota Belt Line Railway Transfer Co.—Incorporated in Minnesota. The company will build terminal lines in Minneapolis and St. Paul and between the cities. Capital stock, \$1,000,000.

Missouri, Kansas & Western.—The survey of this road is completed from Ottawa, Kan., to Clinton.

Missouri Pacific.—The machine shops to be erected by this company at Atchison, Kan., will consist of a paint shop, 65x200 ft.; car shed, 60x200 ft.; wood work shops, 100x100, 80x60, and 60x150; fireproof oil-house, 40x60; machine shop, 115x208; blacksmith shop, 80x120; tin shop, 24x80; boiler shop, 76x80; boiler shed, 40x50; brass foundry, 40x50; casting shed, 20x100; office and store-room, 50x115, and other buildings. The cost will be \$300,000.

The company has located a line from Carlton, Kan., to Marquette by way of Lindsborg, and a large force of workmen has begun grading.

Work has begun again on the unfinished 7 miles of the Paoli branch lying next to Kansas City, for which the McCracken Brothers are contractors. It will be completed within seven weeks.

The county of Pottawatomie, Kan., has voted \$275,000 bonds, which insures the building by this company of about 80 miles of road in this country, to be completed by Decem-

ber, 1888. The roads will connect with the Missouri Pacific at Topeka, one running northwest to Irving, on the Central branch, and another connecting with the latter at Wetmore and traversing the county from northeast to southwest.

The survey of a branch line running from Jennings Falls, in Yell County, to Hot Springs, Ark., has been completed, and it is expected that the road will be built this year.

It is said that the company contemplates building two more roads in Texas, one to run east from Waco to Trinity Station on the International & Great Northern, and one from Colmesneil through Eastern Texas and Western Louisiana, perhaps to Alexandria or Opelousas, and connect with the New Orleans Pacific at one of these points.

New Haven & Derby.—The New Haven Board of Finance has voted to recommend that the offer of W. H. Starbuck, representing the New York & New England, to pay \$275,000 for the city's interest in this road, the conditions being that the road shall be extended to connect with the New England road within 100 days. The New York, New Haven & Hartford's offer of \$300,000, and S. H. McLean's offer of \$325,000 are rejected by the board.

New Haven & Northampton.—The stockholders voted last week to ratify the lease of their road to the New York, New Haven & Hartford for 99 years.

New Mexico Central.—This company was organized in Santa Fe, N. M., last week.

New Roads.—A number of residents of Pasadena, Cal., have organized a company to build a road to Wilson's Peak, one of the highest points in the Sierra Madre mountains, about 5 miles north of Pasadena. It will be similar in design to the Mount Washington road. A hotel will be built on the mountain.

Work was begun last week on the Seaboard Manufacturing Company's logging road near Mobile, Ala. The line will reach about 30 miles from the Mobile River, which it leaves at a point about 8 miles north of Mount Vernon. The company has bought 25,000 acres of land from the Mobile & Ohio road. Rudolph Benz, of Mobile, is the engineer in charge. The Seaboard Company's road will cross the Mobile & Birmingham at Calvert Station.

New York & Baltimore.—Chancellor McGill, of New Jersey, has granted an injunction restraining this company and the Staten Island Rapid Transit Co. from building a bridge and viaduct across the Arthur Kill at New York harbor. Attorney-General Stockton, in behalf of New Jersey, filed information upon which the injunction is based. He alleges that the building of the bridge would be an invasion of the rights of New Jersey, and cannot be done without consent of the Legislature. The defendants claim that the act of Congress of June, 1886, gives them the power to build the bridge, and under it they cannot be restrained. It is presumed the issue will be taken to the United States Court for adjudication.

New York, Woodhaven & Rockaway.—This road, with its equipment, was sold on June 28 to satisfy a mortgage of \$600,000 held by the Metropolitan Loan & Trust Co., of New York. The Long Island Railroad Co. bought the road for \$600,000. It extends from Glendale Junction, L. I., to Rockaway Beach, 11 miles. The company was organized in 1877 by James M. Oakley, who was its president up to the time of his death a few months ago. The road never paid expenses.

Northeastern Nebraska.—Amended articles have been filed in Nebraska. This is a branch of the Chicago, St. Paul, Minneapolis & Omaha, and the amendment locates a line to be built from Wayne, Neb., through Wayne, Dixon, Cedar and Knox counties to Niobrara on the Missouri River. Work will begin immediately.

Northern Pacific.—This company has filed its answer to the order of the Secretary of the Interior which required the land grant railroad companies to show cause why the several orders of withdrawal from settlement of the lands within their indemnity limits should not be revoked and the lands restored to settlement. The company asserts that it has thus far promptly asserted its rights to the land within its indemnity limits to the extent that the action of the government and the Land Department will permit; that it can go no further until the government surveys the remaining granted and indemnity lands, and no faster than those surveys progress; and that the revocation or rescinding of the orders of withdrawal will not simply put others on an equal footing with the company, but will give them unjust advantage, for the unsurveyed lands would at once be open to settlement and appropriation, while the company would have to wait the survey of the lands before it could make selection, at which time it would find large quantities already appropriated.

The company will build new shops at Mandan, Dak., at an expense of \$500,000.

Northern, of New Hampshire.—This company will take possession of and manage its own road on July 1 in accordance with the recent decision of the Supreme Court. The road was leased to the Boston & Lowell in 1884 for a period of 99 years. Shortly after the execution of this lease, suits were begun to secure its annulment.

Northern, of New Jersey.—This road, which is operated by the New York, Lake Erie & Western, is to be double-tracked from the junction at Bergen to Nyack, N. Y.

Ohio Central.—Judgment for plaintiff was entered in the U. S. Court at Toledo, Ohio, last week in the sum of \$5,408,050, in the case of the Central Trust Co., of New York, against this railroad company. Of this amount, \$2,408,050 is for a deficiency of 3,000 first mortgage bonds of \$1,000 each, interest on which has been paid up to and including June 30, 1885, and \$197,311 of the principal of each bond. At the same time judgment was entered in the sum of \$3,000,000, being the deficiency on 3,000 main line income bonds of \$1,000 each. This was also in favor of the Central Trust Co., as trustees of the first mortgage bonds.

Ohio & Mississippi.—This company has obtained an injunction against the Cincinnati, Indianapolis, St. Louis & Chicago, restraining the latter company from preventing the Ohio & Mississippi from using its tracks to get into the Central Union Depot in Cincinnati.

Omaha & Yankton.—Articles of incorporation filed in Nebraska. The proposed line will run from Omaha, northwestward, into Dakota, by way of Yankton, through the counties of Douglas, Washington, Dodge, Cummings, Burt, Wayne, Dakota, Dixon and Cedar, in Nebraska. Capital stock, \$3,000,000.

Pacific.—The United States Commission has been holding daily sessions in Omaha, Neb., during the past week. The western witnesses are a great deal more talkative than their eastern contemporaries, and also seem to possess better memories. Thomas L. Kimball, General Traffic Manager of the Union Pacific; G. N. Crawford, a professional "lobbyist"; W. A. Paxton, a stock-yard man; and Erastus Young, General Auditor of the Union Pacific, have been examined at considerable length.

Two of the commissioners opened proceedings in Sioux

City, Ia., on June 29. William T. Fitch, General Manager of the Sioux City & Pacific; F. C. Hill, formerly General Freight and Passenger Agent of that road; George D. Perkins, a newspaper editor, and Jonas M. Cleland, mayor of Sioux City, were the witnesses examined at the first session.

Pacific Coast.—An addition of 12 miles is to be made to this road, which now runs from Port Harford, Cal., to San Luis Obispo, and from the latter place south to Los Alamos, 63 miles. The extension is to the Santa Ynez River, where a new town, to be called Yncenete, will be located.

Paducah & Mount Vernon.—Consolidation articles have been filed in Illinois by the Mount Vernon & Wabash, of Indiana, and the Paducah & Mount Vernon, of Illinois, under the above name.

Philadelphia & Reading.—The company has bought in New York 15 coal barges, with a capacity of 12,000 tons, and three steam tugs. These will be added to the fleet of coal carrying vessels taking cargoes from Port Richmond.

Pittsburgh & Western.—The stockholders effected a reorganization of the company at Pittsburgh, Pa., last week. According to the plan agreed upon, the old bondholders will receive for their old bonds two-thirds of the amount in bonds of the reorganized company, and the remaining one-third in preferred stock. The old bonds of \$1,000 denomination are 6 per cent. The new bonds will bear 4 per cent., and the dividend on the preferred stock will amount to 5 per cent. The other leading feature of the reorganization is the assessment of 4 per cent. on the amount of stock held by the old stockholders, for which they will receive double the amount in preferred stock and an equal amount of the common stock of the new company.

The remainder of the purchase money for the road, amounting to \$950,000, has all been paid in, the terms of the sale being 5 per cent. of the \$1,000,000 down, or \$50,000, and the remainder upon confirmation of the sale by the Court. The \$950,000 has been paid over in various sums, the greater portion being in bills of exchange.

Pueblo, Bessemer & Highland Park Circle.—This company has been organized for the purpose of building a road to encircle the city of Pueblo, Col.

Red Cloud, Kirwin & Southwestern.—Incorporated in Kansas. The company proposes to build a road from the state line near the county line between Jewell and Smith, through Phillips, Rook, Ellis, Ness and Hodgeman to Garden City, and a line beginning at Kirwin in Phillips County, to Phillipsburg and thence northwestward along the line of the state. Capital stock, \$3,000,000. Office, Kirwin.

Red River Valley.—Hugh Ryan, of Toronto, is the contractor for this road, which is to be built by the Government of the Province of Manitoba from Winnipeg, to a connection with the Northern Pacific road at the international boundary, a distance of 65 miles. Alexander Stewart is the Chief Engineer.

Attorney-General Hamilton, of Manitoba, has expressed himself forcibly to the effect that under an act and all circumstances the road is to be built. He says that the adoption of the Disallowance Bill by the Dominion Government would make no difference. He expects the contractors to begin work this week.

Richmond & Danville.—On application of Deborah Powers, Albert E. Powers and Nathaniel D. Powers, the Court has issued an injunction restraining this company and the Central Trust Co., of New York, from paying the 3 per cent. dividend voted by the directors on June 9, and payable July 1.

Roanoke & Tar River.—The track is laid 9 miles south from Boykins, Va., and grading is completed for 26 miles. An iron bridge has recently been finished by the Phoenix Bridge Co. over the Meherrin River.

St. Johns River, Lake Mir & Gulf.—This company has been chartered at Tallahassee, Fla.

St. Paul Belt.—Incorporated in Minnesota to build a road from Third street in St. Paul, northwest to the Minneapolis, Sault Ste. Marie & Atlantic road in the town of White Bear, with a branch from this line eastward to the Minneapolis & Northwestern road in Ramsey or Dakota County, thence to a connection with the Chicago, Milwaukee & St. Paul, the Minneapolis & St. Louis and the Minneapolis & Pacific at a point near Minneapolis.

Southern Pacific.—It is reported that trains are running on the Newhall branch to Carpinteria, Cal., 17 miles west of San Buenaventura, and only 10 miles from Santa Barbara. The road is graded to within 4½ miles from Santa Barbara, and by the middle of next month trains are expected to be running to that point.

It is reported that work will be soon commenced on a road from Astoria, Oregon, to Forest Grove, a distance of 110 miles. The line will connect with the Oregon & California branch of the Southern Pacific.

Topeka, Stockton & Northwestern.—Incorporated in Kansas to build a road from Topeka, through the counties of Shawnee, Jackson, Pottawatomie, Riley, Clay, Ottawa, Lincoln, Russell, Osborne, Rooks, Phillips and Norton to Stockton, Rooks County. Estimated length of road, 320 miles.

Trumbull & Mahoning.—Incorporated in Ohio. The purpose is to build a road from Niles, Trumbull County, through Trumbull and Mahoning counties to a point on the line between the states of Pennsylvania and Ohio, in Poland Township, Mahoning County.

Union Pacific.—The company announces a new through freight tariff from San Francisco (via Portland) to all points on the Oregon Short Line, Utah & Northern and Montana Union railroads, Utah Central Railway, Ogden to Spanish Fork, inclusive, and points on the Northern Pacific, Garrison to Helena, inclusive. The rates that it makes to Utah points are virtually the same as formerly over the Central Pacific. The same is the case in the rates to Helena, Montana, but those to points in Idaho are materially lower. In order to connect with its system at Portland, Oregon, the Union Pacific will run three steamers out of San Francisco. The new plan is expected to take away much of the joint freight trade with the Central Pacific.

Upper Coos.—Work is to begin on the North Stratford, N. H., and Colebrook division of this road on Aug. 1. It is expected that the line will be completed to the Canadian border, to a connection with the Megantic system, by the summer of 1888.

Utah.—Incorporated at Salt Lake City. The road will begin in the Grand River Valley at a point on the east line of Utah and from southwestward to a point at or near the town of Salina, Utah, and thence into the Utah Valley and to Salt Lake City, with a branch from Salina southwestward through the Sevier Valley to a point near the north line of Piute County, thence westerly to a point on the west of Utah.

The main line will be 325 miles long, and the branch lines 125 miles long. Capital stock, \$7,500,000.

Wisconsin Central.—Work was begun this week on the foundation of a depot for this company in Chicago. The location is at Fifth avenue and Harrison street, on a large lot bought from the government. It will be of stone and iron, of a highly ornamental style of architecture, and is estimated to cost from \$500,000 to \$700,000.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Month of May:	1887.	1886.	Inc. or Dec.	P. c.
Central Iowa.....	\$94,301	\$108,492	D. \$14,191	13.0
Cleve. & Mar.....	22,486	23,909	D. 1,423	5.4
Col. H. Vy. & Tol.....	189,500	167,788	I. 21,712	12.3
Col. & Rome.....	2,951	3,888	D. 937	24.0
Den. & Norwalk.....	19,501	18,229	I. 1,272	6.9
Den. & R. G. W.....	71,559	78,495	D. 7,245	9.2
Illinois Central.....	5,019,493	4,560,742	I. 458,751	10.0
Keokuk & West.....	24,039	32,804	D. 8,765	26.6
Mexican Cen.....	394,900	318,403	I. 76,497	24.0
Nash. C. & St. L.....	253,501	172,320	I. 80,871	46.9
N. Y. Sus. & W.....	167,707	87,704	I. 80,003	23.5
Pennsylvania.....	4,865,640	4,178,580	I. 686,460	13.9
S. P. M. & Man.....	2,841,029	2,465,671	I. 375,358	15.2
South Carolina.....	68,946	58,416	I. 10,530	18.0
Tol. P. & West.....	72,927	64,357	I. 8,570	13.3
Total.....	\$14,017,280	\$12,339,318	I. \$1,740,523	14.1
Net.....			D. 32,561	
Net.....			I. \$1,707,962	14.1

Four months—Jan. 1 to April 30:

Allegheny Valley.....	\$518,856	\$545,832	I. \$26,976	5.2
Net earnings.....	248,247	194,036	I. 54,211	27.9
Balt. & Potomac.....	453,921	412,334	I. 41,587	10.0
Net earnings.....	139,908	148,039	D. 8,151	5.5
California South.....	516,542	19,882	I. 325,660	170.4
Net earnings.....	254,034	41,206	I. 212,828	51.7
Canadian Pac.....	2,723,793	2,457,123	I. 266,670	10.8
Net earnings.....	236,453	608,065	D. 371,612	61.1
Central of N. J.....	3,405,411	3,023,294	I. 382,117	12.6
Net earnings.....	1,537,333	1,142,737	I. 394,596	34.4
Grand Rap. & L.....	869,847	702,684	I. 167,163	23.6
Net earnings.....	284,952	222,770	I. 62,182	27.8
Louis. & Nashv.....	4,905,096	4,171,617	I. 733,479	17.5
Net earnings.....	1,701,08	1,465,287	I. 235,791	16.1
Lou. N. O. & T.....	690,077	526,147	I. 163,930	30.1
Net earnings.....	195,778	10,581	I. 185,197	22.2
Mo. & Charles.....	5,730	492,856	I. 487,126	21.6
Net earnings.....	131,573	120,768	I. 10,805	8.9
Minn. & N. W.....	300,255	98,195	I. 202,060	211.8
Net earnings.....	65,340	21,338	I. 44,002	206.5
N. Y. Ont. & W.....	404,806	35,746	I. 51,000	14.4
Net earnings.....	29,462	4,880	I. 24,582	50.1
No. folk & West.....	1,223,770	885,561	I. 338,209	38.1
Net earnings.....	488,677	302,329	I. 186,348	24.5
Northern Central.....	2,031,519	1,702,628	I. 328,891	19.3
Net earnings.....	868,328	656,426	I. 211,902	32.3
Northern Pacific.....	3,348,334	2,926,100	I. 422,234	14.4
Net earnings.....	1,029,404	1,106,566	D. 77,162	7.6
Ohio & Miss.....	1,297,238	1,124,566	I. 172,672	15.3
Net earnings.....	425,468	281,769	I. 143,699	51.0
Phila. & Reading.....	6,600,505	5,398,617	I. 1,201,888	22.2
Net earnings.....	1,873,028	1,419,270	I. 453,758	31.9
Coal and Iron.....	4,643,928	3,816,117	I. 827,811	21.6
Net earnings.....	105,721	769,061	D. 663,340	34.6
Shenandoah Val.....	250,789	186,158	I. 64,631	34.6
Net earnings.....	28,464	314	I. 28,150	9.0
St. Jo. & Gd. L.....	378,778	369,226	I. 9,552	2.5
Net earnings.....	154,404	179,705	D. 25,301	16.0
Union Pacific.....	8,326,787	6,955,437	I. 1,371,350	19.7
Net earnings.....	2,816,080	2,252,896	I. 563,184	24.9
Total (gross).....	\$43,414,492	\$36,378,600	I. \$7,035,892	19.3
Total (net).....	13,989,231	9,997,804	I. 4,991,427	45.8
Net.....			D. \$489,226	
Net.....			I. 4,091,417	45.8

Year to Dec. 31:

Ches. O. & S. W.....	\$1,713,325	\$1,571,155	I. \$142,170	9.0
Net earnings.....	651,492	502,530	I. 148,962	29.6
Chic. & W. Ind.....	700,927	.....	.....	.....
Net earnings.....	196,144	.....	.....	.....
Gal. H. & S. A.....	2,599,462	3,199,077	D. 599,615	18.7
Net earnings.....	277,039	1,494,077	D. 1,217,038	24.1
South Carolina.....	1,120,060	1,151,840	D. 31,780	2.7
Net earnings.....	137,404	328,157	D. 190,753	81.4
Wisconsin Cen.....	1,565,313	1,491,004	I. 74,309	5.0
Net earnings.....	383,233	509,123	D. 125,890	24.7
Total (gross).....	\$6,998,160	\$7,383,076	D. \$384,916	5.2
Total (net).....	1,449,168	2,833,917	D. 1,384,749	48.8
Year to March 31:	1886-87.	1885-86.		
Chi. R. I. & Pac. (\$12,319 05)	\$12,319,051	\$12,004,348	I. \$314,702	4.3
Net earnings.....	4,814,241	4,837,435	D. 23,194	0.5
Nor. of N. H.....	210,275	202,572	I. 7,703	3.7
Net earnings.....	30,437	22,734	I. 7,703	33.5

* Deficit.
Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Cotton.

The cotton movement for the week ending June 24 is reported as below, in bales:

Interior markets.....	1887.	1886.	Inc. or Dec.	P. c.
Receipts.....	4,932	6,925	D. 1,993	28.4
Shipments.....	5,793	15,567	D. 9,774	62.1
Stock.....	43,252	96,632	D. 53,380	53.3
Seaports:				
Receipts.....	2,364	14,363	D. 11,999	83.6
Exports.....	10,072	49,756	D. 39,684	79.7
Stock.....	292,385	388,588	D. 96,203	24.7

Total movement from plantations for the crop year ending June 24 was 6,312,166 bales, against 6,425,026 last year, 5,582,127 in 1884-85, and 5,615,132 in 1883-84.

Coal.

The coal movement for the week ending June 25 is reported follows:

Anthracite.....	1887.	1886.	Inc. or Dec.	P. c.
.....	688,370	543,572	I. 144,798	26.6
Bituminous.....	276,362	258,598	I. 17,764	6.9
Coke (June 18).....	23,433	70,787	D. 47,354	68.

Cumberland coal shipments for the week ending June 25 were 54,809 tons, and for the year to date, 1,492,172 tons, an increase of 750,856 tons over last year.

The coal tonnage of the Pennsylvania road for the week ending June 18, was:

Line of road.....	Coal.	Coke.	Total.	1886.
Year to June 18.....	4,833,444	1,587,815	6,421,259	6,681,363
Increase for the week 426 tons, or 0.1 per cent.; decrease for the year 260,104 tons, or 3.8 per cent.				

East-bound Shipments.

The shipments of all freight except live stock from Chicago last week eastward to seaboard points aggregated 41,433 tons, an increase of 11,837 over the previous week. The percentages of the various roads were as follows: Baltimore & Ohio, 18.7 per cent.; Chicago & Grand Trunk, 11.3; Chicago, St. Louis & Pittsburgh, 12.7; Lake Shore & Michigan South-

ern. 14.8; Michigan Central, 11; New York, Chicago & St. Louis, 5.6; Pittsburgh, Fort Wayne & Chicago, 24.2; Cincinnati, Indianapolis, St. Louis & Chicago, 1.7.

The Inter-state Commission.

The Commission has arranged the following schedule for the hearing of cases after July 12, on which day it will re-assemble at Washington:

July 13—Farmers and milk producers of Orange County, N. Y., against the New York, Lake Erie & Western and other roads, alleging unjust discrimination.

July 14—William A. Holbrook, of St. Thomas, Dak., against the St. Paul, Minneapolis & Manitoba, alleging that the carrier makes itself a preferred shipper.

Wm. A. Fulton, of Hudson, Wis., against the Chicago, St. Paul, Minneapolis & Omaha, alleging unreasonable freight charges.

F. D. Harding, of Hudson, Wis., against the Chicago, St. Paul, Minneapolis & Omaha, unreasonable freight charges.

July 15—Associated Wholesale Grocers of St. Louis against the Missouri Pacific for violations of sections 1 and 2 of Interstate Commerce act.

Traders' and Travelers' Union, of New York, against the Philadelphia & Reading and Lehigh Valley companies, cancellation of contracts governing transportation of extra baggage.

July 19—Providence Coal Company against Providence & Worcester road, illegal discrimination.

Keith & Wilson, of Covington, Ky., against Kentucky Central and other roads, freight discrimination.

July 20—E. B. Raymond, Mazeppa, Minn., against Chicago, Milwaukee & St. Paul, discrimination and violation of section 3.

William H. Council, of Huntsville, Ala., against Western & Atlantic road, discrimination on account of passenger's color.

July 21—Ralph W. Thatcher, of Albany, N. Y., against thirteen railroads, alleged unjust discrimination.

Regulating Northwestern Rates.

The general managers and general freight agents of the various roads in the Western and Northwestern Railroad Freight Bureau met in Chicago on June 29. It was decided to place in charge of the chairman the publication of all tariffs, rules and regulations on competitive traffic. All lines pledged themselves to make no changes in the rates except by prior notice to the chairman, such notice to become effective 10 days from the receipt of it by the chairman. It was also decided to include within the scope of this resolution not only St. Paul, Minneapolis, Council Bluffs and Omaha, but also the business from competitive points in Iowa, Minnesota and Dakota. The chairman was also instructed to draw up a form of guarantee to govern the organization, which plan is to be submitted to a meeting of general managers to be held in this city July 7. It was also agreed that the general freight agents should convene early next week to take up the matter of rates, and put all tariffs into line in the manner contemplated by action of the meeting.

Central Traffic Association.

The General Managers of the lines in the Central Traffic Association concluded their meeting in Chicago last week. There was considerable business done on the last day.

In order to meet the competition of the Chesapeake & Ohio it was decided that the rate on manufactured tobacco in hogsheads and cases be made on a basis of 25 cents from Chicago, taking effect at once. Regarding through freight arrangements with the transcontinental lines, the following resolutions were adopted:

"Resolved, That the Chairman is hereby authorized to continue negotiations with the Transcontinental Association and Western Traffic Association for the establishment of through rates and divisions to cover transcontinental freight traffic to and from the western termini of the trunk lines and intermediate points, and report same to this association for confirmation.

"Resolved, That east-bound through rates from Pacific Coast points which are agreed to by the Central Pacific, Northern Pacific and Atchison companies as requisite to meet the competition of the Canadian Pacific, Isthmus and Cape routes, will be shared by the railways in this association on the basis of 25 per cent., as agreed, subject to concurrent action by the trunk lines and the minimums printed.

"Resolved, That any concessions in Pacific Coast rates to or from points in the territory of the Central Traffic Association shall be approved by its Freight Committee before adoption.

There was a lengthy discussion regarding proposed changes in the official classification, and finally the following preamble and resolutions were adopted:

"WHEREAS, The present official classification applies to all east-bound and west-bound traffic both in the territory of the Trunk Line Association and of the Central Traffic Association; and

"WHEREAS, In view of this large area covered and the far-reaching effects which follow from additions, alterations, or rulings relating to classification, a wider representation of the important interests involved and a better understood and speedier procedure should, if practicable, be provided; therefore be it

"Resolved, That a Classification Committee of the Central Traffic Association be constituted as follows: (Names to be agreed upon); that this committee proceed to the election of its chairman and that its office be at Chicago.

"Resolved, That all applications for changes or additions to the classification and for rulings and interpretations relating thereto which originate in the territory of this association upon both east-bound and west-bound traffic be referred to the chairman of this committee.

"Resolved, That it be respectfully suggested that a like Eastern Classification Committee be appointed from the trunk lines and their eastern connections, with like duties, powers, and forms of procedure.

"Resolved, That it be recommended that both the foregoing Classification Committees communicate their recommendations to the Chairman of the Joint Standing Classification Committee as at present constituted as promptly in each case as practicable, and that no classification or ruling shall take effect until said Standing Committee confirms and promulgates the same, it being understood that when this Standing Committee shall have confirmed no vote of the Joint Committee be thereafter required, as it causes delay.

"Resolved, That the foregoing resolutions are respectfully recommended to the Joint Committee for speedy adoption."

It was agreed that live stock (except horses) and articles to be exhibited at fairs be returned free under the usual restrictions.

It was also resolved that no more additional commodity rates or tariffs shall be authorized or put in effect by any road in the association, except by consultation and agreement of its freight committee. As to the tariffs now in force, the railways affected thereby may, at their option, issue similar tariffs on the same articles between the same points, but only on the same articles pending the action of the freight committee; that a meeting of the freight committee be held in this city Wednesday, July 6, at 10:30 a. m., to consider the proper procedure in issuing, filing, and altering, or withdrawing all commodity tariffs on any line which effect the interest

of the companies or their manufactories between the same or dissimilar points; that this committee consider how far the questions involved in commodity rates can be adjusted by the addition of a new class to the official classification. If the committee fails to agree the questions of difference shall be referred, with its report, to the managers for action.

The following resolutions were also adopted:

"Resolved, That the rule for making competitive rates from and to points in or beyond the territory of the Central Traffic Association shall be that the rates on all classes shall be not less than those of the short line, whether such short line is composed of one or more railways, and the long line, whether composed of one or more railways, shall not reduce the same.

"Resolved, That where one and the same railway passes through shorter points (to which a railway competing into it is the short line) to reach a further point on its own rails it shall not be deprived of access to any of its own stations over its own road by any rule or arbitration.

"Resolved, That all reductions that have been made in the state or inter-state tariffs, put in effect April 1 to 5, 1887, upon competitive traffic, shall be considered by appropriate freight committees, and if the restoration of rates to said tariffs or an agreement as to what said rates should be is not reached in the ten days allowed by law for advances in the rates, the same shall in like manner be decided by arbitration promptly at the end of said period.

"Resolved, That in all cases when, from any cause growing out of the inter-state law or otherwise, any other changes of said competitive rates are hereafter desired or required, all the parties thereto will in all cases confer with each other with a view to an agreement thereon, failing which they will refer the subjects of differences to disinterested arbitration not later than ten days after written notice by any one party that it desires such consideration.

"Resolved, That all roads members of this association furnish its chairman with the percentage basis of through rates and divisions of same, or rates per hundred pounds allowed by them to their connecting roads west of a line drawn from Chicago through Lozanoport, Kokomo, and Indianapolis to Louisville, carrying east and westbound competitive traffic to and from the Western termini of the trunk lines or east thereof, to the end that he may compare the same and recommend to this association a uniform basis for its adoption."

Demoralization in Grain Rates West of Chicago.

At a late joint meeting of the Western railroads held in Chicago, it was shown that a reduction in grain rates inaugurated in Central Nebraska had been extending to parallel lines in that state and in Northern Kansas, and had led to a request for a corresponding reduction locally from Missouri River points to Mississippi River points and Chicago. The fact was also elicited that a reduced through rate on corn to Baltimore from points in Nebraska had been published which was less than the lowest combination of locals from Missouri River points to Baltimore via St. Louis or Chicago. Other lines declared their intention to meet such offers whenever they encountered them, regardless of whether the reduction should be wholly borne by the line east of the Missouri River or be shared by the lines east and west of that river. As such attitude, if carried out, would lead to general demoralization in rates, which all the lines were anxious to prevent, the following action was taken:

"That the rates east-bound from all points on or west of the Missouri River to the Atlantic seaboard and to points east of the western termini of the trunk lines shall be based upon agreed tariffs to St. Louis, plus the agreed and authorized tariffs of the Central Traffic Association from St. Louis or East St. Louis to destination; that rates via other routes than via St. Louis shall only be equalized in such manner as may be authorized by Chairmen Midgley and Faithorn; that the lines here represented pledge themselves to quote no lower rates and publish tariffs on no lower basis, regardless of offers which may be made by Eastern roads; provided, that the prohibition of such quotations of rates or issue of tariffs shall only apply to business originating east of the western boundary line of the states of Kansas and Nebraska; that on business originating west of that line each road may quote rates based upon the agreed rates of the associations east of the Missouri River, added to such rates east as may be quoted by any connection; it being understood that either party may withdraw from the foregoing by giving five days' notice by telegraph to either of the chairmen named herein."

Rates Restored by the Wabash.

The Wabash, St. Louis & Pacific has given notice that on July 4 its rates (lately reduced) from Chicago to Eastern points will be advanced to the same rates as quoted by the other roads running east from Chicago. The freight already forwarded by the Wabash at the reduced rates, and that which it will take between now and the time when the advance in rates can be put in effect, will now be taken care of by its eastern connections, but the Wabash will have to change the bills of lading and will have to make good itself the difference in rates to shippers.

New York State Canals.

The Union for the Improvement of the canals of the State of New York, of which George Clinton is president and Frank S. Gardner is secretary, have issued a call for the third annual convention on Thursday, July 28, at the Common Council chamber, Rochester, N. Y.

Two Thousand-mile Tickets.

The Michigan Central will, on July 1, place on sale 2,000-mile tickets, open to anybody at 2 cents a mile. These tickets will be good for one year for any member of a firm, or by man, wife or children, singly or collectively. The company will also issue 1,000-mile tickets, good for one year, at 2½ cents per mile, and at the same rate for 500 miles, good for six months.

Quarantined Cattle.

The St. Paul, Minneapolis & Manitoba has issued a circular to the effect that cattle from infected districts in Illinois, Pennsylvania, New York, New Jersey, Maryland, Delaware, District of Columbia, Virginia, Vermont and Texas, destined for points in Montana, will be quarantined 90 days at Fort Buford. Those destined to Dakota points are to be quarantined 90 days at Minnesota Transfer, unless accompanied by a certificate of health from the veterinary surgeon of the district from which they were shipped.

Dividing Anthracite Coal Tonnage.

Beginning with this week, the Philadelphia & Reading and Pennsylvania Railroad companies will divide the anthracite tonnage in the Schuylkill Valley. The former will deliver to the latter 500,000 tons of coal at a point near Pottsville, Pa., which is to be hauled at the regular toll rate for the Reading.

Lake Superior Ore Trade.

The lack of ore cars and vessels is greatly delaying the movement of Lake Superior ores. The Gogebic mines, according to a correspondent of the *Iron Trade Review*, can produce 2,000,000, but will not be able to ship 1,500,000 tons of ore this season. The railroads do not furnish cars enough to

take the ore away as fast as received, and the vessels do not take it from the pockets as fast as the railroads deliver it. Freight from Ashland to Cleveland is \$2.50 per ton.

Escanaba, from which port the Menominee and most of the Marquette ores are shipped, probably has the best facilities for shipping ore, and the mariners prefer this port on the ground of superior safety and less insurance. The same authority says there is a growing conviction that all the Lake Superior deposits will, in the course of a few years, be found to be connected together, as black ore similar to that mined at Marquette is being found southeast of Gogebic Lake.

ANNUAL REPORTS.

Newport News and Mississippi Valley Co.

This company, incorporated in Connecticut in 1884, leases the Chesapeake & Ohio, Elizabethtown, Lexington & Big Sandy and Chesapeake, Ohio & Southwestern roads. The leases are respectively for 250 years from July 1, 1886; 250 years from Feb. 1, 1886, and 50 years from Feb. 1, 1886. The report is to Jan. 1, 1887, thus including six months for the first named road and 11 months for the other two, but the traffic statistics are for the full calendar year. The roads leased aggregate 1,039.79 miles and constitute a through line from Newport News, Va., to Memphis, Tenn., with the exception of the gap of 93.5 miles between Lexington and Louisville, Ky. The exchange of stock of the new company for stock and bonds of the several lessor companies, although not yet completed, has been assented to by enough holders to insure its success. The extension of the Elizabeth, Lexington & Big Sandy from Ashland, Ky., to Cincinnati is expected to be completed this year.

The equipment consists of 257 engines, 78 passenger, 2 sleeping, 8 combination, 39 baggage and 7 other passenger train cars; 3,394 box, 364 stock, 594 flat, 4,351 coal, 173 caboose and 196 service cars. Of the freight cars 2,001 are 25-ton and 4,082 are 20-ton capacity.

The general account is as follows:

Liabilities:		
Common stock issued.....	\$11,286,100	
" " scrip.....	14,225	
		\$11,300,325
Vouchers and pay rolls.....	\$979,494	
Taxes.....	39,766	
Coupons E. T. bonds.....	14,160	
Sundry roads and persons.....	440,439	
Due C. & O. Ry.....	106,600	
" E. L. & B. S. R. R.....	108,121	
" S. R. Ry., Transfer Co.....	30,557	
		1,718,937
Balance.....		\$869,848
		\$13,889,110
Assets:		
C. & O. 6 per cent. bonds, par value.....	\$1,723,600	
E. L. & B. S., common stock, par value.....	1,055,500	
C. O. & S. W., common stock, " ".....	3,442,000	
C. O. & S. W., preferred stock, " ".....	5,579,600	
		11,800,700
Cash and cash items.....	\$869,201	
Sundry roads and persons.....	261,301	
U. S. Post Office Department.....	26,619	
Unadjusted accounts.....	41,642	
Greenbrier & New River R. R.....	9,356	
S. R. Ry. Transfer Co.....	113,255	
C. O. & S. W. R. R.....	218,546	
Supplies on hand.....	548,490	
		2,088,410
		\$13,889,110

The earnings for the calendar year were as follows:

	1886.	1885.	Inc. or Dec. P. c.
Freight.....	\$5,993,486	\$4,274,137	1. \$1,019,348 24
Passenger.....	1,189,772	1,106,023	1. 83,748 64
Mail and express, etc.....	263,646	258,700	1. 4,947 02
Total.....	\$6,746,904	\$5,638,860	1. \$1,108,043 20
Expenses.....	4,539,274	4,876,440	1. 662,794 17
Net.....	\$2,207,630	\$1,762,381	1. 445,249 25
Gross per mile.....	6,487	5,422	1. 1,065 19
Net.....	2,123	1,694	1. 429 25
P. c. of exps., not including taxes.....	67	69	D. 2

The traffic for the year was as follows:

	1886.	1885.	Inc. P. c.
Coal, tons.....	1,294,882	1,281,700	13,182 10
Local freight.....	1,103,477	990,605	112,872 11
Through.....	1,600,613	1,061,882	538,731 60
Total coal and mdse.....	3,998,972	3,274,187	724,785 22
Millions of ton miles:			
Coal (39 per cent.).....	326	320	6 2
Local freight (13 per cent.).....	111	98	13 13
Through (48 per cent.).....	401	234	167 71
Total.....	837	652	185 28
Local passengers.....	1,162,013	1,077,130	84,883 8
Through.....	139,304	111,224	28,080 25
Total.....	1,301,317	1,188,354	112,963 9.5
Millions of passenger miles:			
Local (62 per cent.).....	32.89	30.84	2.05 7
Through (38 per cent.).....	20.45	16.69	3.75 23
Total.....	53.34	47.53	5.81 12

The average passenger journey was—

Local.....	28.30 miles.
Through.....	146.83 "
All.....	40.99 "

The average haul on coal was 251.61 miles; on local freight, 100.48 miles; through freight, 250.35 miles; and of the whole 209.39 miles.

Gross earnings per ton per mile..... .632 cent.
Expense per ton per mile..... .413 "
Profit per ton per mile..... .219 "

Gross receipt per passenger per mile:
Local..... 2.403 cents.
Through..... 1.952 "
All..... 2.230 "
Expense..... 2.033 "
Profit..... 0.197 "

The revenue train mileage was:

Freight.....	5,247,603
Passenger.....	1,813,366

The average freight train load was:

On the Ches. & Ohio.....	170.61 tons.
" E. L. & B. S.....	133.23 "
" C. O. & S. W.....	137.60 "

Per train mile the gross earnings were:

Freight.....	100.87 cents.
Passenger.....	75.72 "
All.....	95.53 "
Expense.....	64.29 "
Net earnings.....	31.26 "

President Huntington's report refers to the steady and large increase in the traffic and earnings of the road since the completion of the Western division to Memphis, and holds out the hope of a dividend in the near future. The freight traffic for the first quarter of 1887 exceeds that of the same period last year by 40 per cent.